Age
1930

The RUBBER AGE

VOL. 26, NO. 12 MARCH 25, 1930

LATE NEWS of the Industry

United States Rubber Consumption Was 32,726 Tons During February

CONSUMPTION of crude rubber of all classes by manufacturers in the United States in the month of February is estimated at 32,726 long tons, according to statistics compiled by the Rubber Manufacturers Association. This compares with estimated consumption of 36,669 long tons in January and 41,594 long tons in February, 1929.

Imports of crude rubber of all classes into the United States during the month of February totaled 43,728 long tons according to estimates issued by the Rubber Manufacturers Association. This compares with the association's estimates of imports of 47,462 long tons in January and of 64,538 long tons in February, 1929.

Consumption of reclaimed rubber is estimated by the association at 14,918 long tons for February as compared with its own estimates of 16,785 long tons in January and 19,068 long tons in February, 1929.

The association estimates total domestic stocks of crude rubber on hand and in transit overland on February 28th, at 131,748 long tons compared with 120,649 long tons as of January 31st and 90,057 long tons as of February 28th, 1929. Crude rubber afloat for United States ports on February 28th, is estimated at 63,404 long tons as against 61,863 long tons on January 31st and 75,793 long tons a year ago.

Fisk Rubber Company Shows Net Loss Of $7,496,457 During the Past Year

THE financial report of the Fisk Rubber Company, Chicopee Falls, Mass., and subsidiaries for the year ended December 31, 1929, shows a total loss of $7,496,457 after interest, depreciation and reserves for the write-down of raw materials, commitments and finished inventories to market as of the end of the year. This compares with a net loss after interest, depreciation and reserves of $8,791,251 in 1929.

Sales for 1929 were $52,790,475, compared with $60,933,841 in 1928. The greater part of the losses suffered occurred in the last half of the year, as the company reported for the six months ended June 30, 1929, a net loss of only $236,713 after full depreciation, interest and amortization charges. The actual operating loss for the past year is given as $2,515,219 after depreciation of $2,250,000, but before interest and reserves. After deducting interest, etc., of $1,520,903 and reserves of $3,460,335 for inventory write-downs, the total loss amounted to $7,496,457.

Concerning the shrinkage of the company's unit sales to dealers, H. T. Dunn, president, declares, "Up to 1929 and as far back as 1924 the company has solicited the business of and depended for its volume upon a large number of small dealers. As competition became more acute through mail order, chain and factory-owned store operations, the weaker of these dealers found it impossible to compete. Proportionately, Fisk dealer outlets decreased and it became evident that only the strongest of independent retail tire dealers could survive. It was, therefore, necessary for your company to revamp its sales organization, sales policy, and product, so as to appeal to and secure this stronger dealer.

"Fundamental in the successful approach to the sales problem was the need of training your sales organization to meet conditions it had not heretofore been called on to combat. This was a costly operation not only from the actual expenditures made but also from the time involved. However, the company's sales organization is now efficiently trained to cope with these special sales problems and today the dealer business of your company is on a sounder basis than it has been in years.

"During 1929 Fisk engineers perfected the Air-Flight principle of tire construction. In order to take full advantage of this advanced method and the resultant modern and superior product it became necessary for your company entirely to replace its mold equipment. While the expenditure involved was great, the sales advantages to your company fully justified the cost.

"To this expense it was necessary to add that of having to sell merchandise on hand of the old construction at liquidation prices. Such sales adversely affected 1929 gross profits, adding materially to the year's operating loss. Discontinued merchandise of this nature remaining on hand Dec. 31, 1929, has been costed in inventory at a price that should insure its early sale at a normal profit."

It was explained that the 1930 program of operating, administrative and selling expenses has been reduced 25 per cent from that of 1929. Of the total assets of $58,813,875 reported, $25,205,515 represented current assets, on a ratio of 10.5 to 1 to current liabilities, but if $8,199,500 of notes maturing on Jan. 1, 1931, are treated as current liability, the ratio is 2.38 to 1.

Seiberling Rubber Company Omits Current Dividend on Preferred Stock

DIRECTORS of the Seiberling Rubber Company, meeting on March 17, took no action on the quarterly dividend on $2 on the company's preferred stock, which was due at about this time. In December the company took no action on the common stock, on which an annual dividend of $1 had been paid in the two previous years.

In the year ended October 31, 1929, the Seiberling Rubber Company showed a net income of $132,207 after depreciation, federal taxes and other charges. This covered the preferred dividends of $129,917 paid out during the year, but left a balance of less than one cent a share on the outstanding 267,346 shares of no-par common stock. Payment of $244,076 in common dividends during the past year left a deficit in the company's income account of $241,786.

In 1928, the Seiberling Rubber Company earned $511,968, or $1.69 a share on 243,848 shares of common stock. Earnings in that year included $108,185 excess over declared value on shares of no-par common stock issued in exchange for three-year 5½ per cent gold notes surrendered and cancelled. In the ten months ended October 31, 1927, Seiberling earnings were $1,016,068, equal to $3.84 a common share.

The drop in unit prices during 1929 caused Seiberling sales to drop to $12,312,231 as compared with $16,329,111 in 1928. The common stock of the Seiberling Rubber Company was probably the worst sufferer among leading rubber manufacturers in the 1929 securities market fall. Seiberling common declined steadily from a high of 67⅞ in December, 1928, to a low of 9 late in December, 1929, and is at present selling only a few points above this level. At its lowest the stock showed a loss in total market valuation of more than $15,000,000. The preferred stock, which sold as high as 107⅛ early in 1929, has now dropped to about 50 on the Cleveland Stock Exchange.

United States Rubber Company Loss Reported at $3,378,412 in 1929

AFTER a year of reorganization and consolidation of facilities, the United States Rubber Company has reported for 1929 a profit of $576,009 after depreciation, interest, subsidiary dividends and the deduction of $2,721,326 for inventory adjustments, but before extraordinary charges. After making provision of $1,490,421 for additional depreciation and of $2,464,000 for extraordinary expenses incident to concentration and reogranization of operations, there was a deficit for the year of $3,378,412. In 1928 net loss after depreciation, interest, taxes and deduction of $15,038,304 for inventory adjustments was $10,781,255.

Net earnings of the United States Rubber Plantations, Inc., for 1929 amounted to $666,044 after reserves for amortization of cost of development, depreciation of plant and equipment and foreign income taxes. These profits were not included in the earnings of the United States Rubber Company.

During the past year, six factories were closed and plans are under way to continue the concentration of the manufacturing and distributing operations of the company. These obsolete factories, including those long since closed, are being offered for sale. The concentration of these manufacturing activities and the reconstruction of the organization have necessitated extraordinary expenditures for the moving and disposition of equipment, inventories and men, and have resulted in temporarily higher costs. "Since all projected improvements have not been completed, these unusual expenses will continue during the year 1930," reports F. B. Davis, Jr., president. "No changes have been made, or will be made, unless decided improvements in operations is evident and benefits due to such changes should result in improvement of earnings in future years."

Despite the decline in unit prices, consolidated net sales have kept to a practically uniform level during the past three years, being $192,962,040 in 1929, $193,480,121 in 1928, and $193,442,945 in 1927. Sales of waterproof footwear showed improvement over 1928 both in dollar values and units, as did sales of rubber-soled canvas shoes. Sales of products for industrial uses also improved, but sales of tires showed a reduction in dollar value despite an increase in number of units. Sales of chemicals manufactured by the chemical subsidiary continued to improve, but sales of reclaimed rubber were adversely affected by tire factory curtailments and by lower selling prices.

The consolidated income account for 1929 compares with the two previous years as follows:

	1929	1928	1927
Sales	$192,962,040	$193,480,121	$193,442,945
Operating profit	14,385,814	14,530,711	12,522,952
Net profit U. S. R. Plan			4,000,000
Total	$ 14,385,814	$ 14,530,711	$ 16,522,952
Depreciation reserve	5,152,727	5,152,727	3,980,571
Interest	5,918,063	6,097,546	6,290,900
Balance	$ 3,315,024	$ 3,280,438	$ 6,251,481
Other income		*1,000,000	
Total income	$ 3,315,024	$ 4,280,438	$ 6,251,481
Sub. dividends	17,689	23,389	17,689
Balance	$ 3,297,335	$ 4,257,049	$ 6,233,792
Inventory adjustment	2,721,326	15,038,304	
Profit	$ 576,009	†$ 10,781,255	$ 6,233,792
Prov. for increased depr.	1,490,421		
Extra expenses	a2,464,000		
Net loss	$ 3,378,412	$ 10,781,255	¶$ 6,233,792
Pfd. dividends			5,208,800
Deficit	$ 3,378,412	$ 10,871,255	‡$ 1,024,992
Previous surplus	18,006,640	40,146,386	40,798,675
Sub. surplus		§1,210,213	
Trs. rf. U. S. R. plt. at srp			8,000,000
Total surplus	$ 14,628,228	$ 30,575,344	$ 49,823,667
Prop. & eq. adj.		10,000,000	
Invent. adj. Jan. 1, 1927			8,910,679
Sundry charges		2,568,704	
Extraordinary charges	b4,000,000		
Adj previous years			766,602
P&L. surplus	c$10,628,228	$ 18,006,640	$ 40,146,386

*Dividends received from U. S. Rubber Plantations, Inc. †Loss. ‡Surplus. ¶Profit. §Surplus December 31, 1927, of subsidiaries heretofore shown as securities of affiliated and controlled companies. aPartly estimated extraordinary expenses incident to concentration and reorganization of operations. bProvision for extraordinary charges to be incurred in connection with future charges in organization and for contingencies. cSubject to determination of federal taxes.

Review of Balloon Tire Patent Case Requested of United States Court

REOPENING of litigation involving basic patents to the balloon type of pneumatic automobile casing that has extended through the past five years is indicated by the filing of a petition asking the United States Circuit Court of Appeals in Cincinnati to review the decision of Federal Judge Arthur J. Tuttle last June in which he cleared the B. F. Goodrich Company of infringing the

patents of the Steel Wheel Corporation of Detroit, Mich.

The filing of this appeal again involves millions of dollars of royalties which the Detroit company expects to collect from Goodrich and practically every other tire manufacturer in the country for 200,000,000 balloon casings turned out in the last six years. If the decision rendered by the Detroit Circuit Court last June is reversed by the Appellate Court in Cincinnati, it is believed that all tire companies that have been making balloon casings will be open to suit for damages. Attorneys for the Detroit company have indicated their intention to take the case to the United States Supreme Court, if necessary, to settle definitely the points involved.

The suit against Goodrich, which is regarded as a test case affecting the whole industry, is based on United States Patent No. 1,537,879, issued on May 12, 1925, to Alden L. Putnam, who filed application for it on August 13, 1920. The patent for a "pneumatic-treaded vehicle wheel" was granted on three claims, and at the time Commissioner of Patents Robertson declared, "My opinion is that applicant's tire is new, both in size and structure, and produces a new result that was not obvious or suggested by making an ordinary or standard tire oversize and inflating it to a pressure less than normal."

The Midland Steel Products Company came into ownership of the patent rights when it purchased the Detroit Pressed Steel Company, to which Putnam had assigned his grant, and merged it with the Parish & Bingham Company of Cleveland. The Steel Wheel Corporation was organized to hold the patent rights, and a deal was effected with the Motor Wheel Corporation, Lansing, Mich., by which the latter took a half interest.

Attorneys for the Detroit company claimed at the trial last year that the rubber manufacturers had appropriated the methods and design described by Putnam in his patent. Merrill L. Clark, defense attorney, argued that balloon tires were made by right of underlying principles known long before 1920 when Putnam "in vague language" described his patent. All major tire manufacturing companies were represented at the trial, which lasted ten days.

No date has as yet been set for the hearing of the appeal by the court at Cincinnati.

Protest on Crude Rubber Freight Rates Heard by Interstate Commerce Commission

DECISION is now being awaited from the Interstate Commerce Commission on the plea of the rubber factories of Akron and other cities for a reduction in railroad freight rates on crude rubber. In oral arguments before the commission at Washngton on March 12, J. C. Colquitt, attorney for the Rubber Manufacturers Association, Inc., appealed from an adverse ruling made recently by an examiner for the commissioner. The commission did not indicate when its decision will be gven.

The rubber factories seek to have crude rubber freight rates reduced from the present fourth class rating to fifth class. The railroads were represented at the hearing by Alfred S. Knowlton, attorney, who urged the commission to uphold the decision in the Goodyear Tire & Rubber Co. case of 10 years ago, which held the crude freight rates in the fourth class.

Citing the fact that the rubber companies pay the larger railroads approximately $3,000,000 in crude rubber freight charges every year, Colquitt went on to show that crude rubber is one of the easiest commodities to handle that the railroads carry. Damage claims paid by the railroads are less than one-quarter of one per cent a year, Colquitt said.

Colquitt also attacked the adverse decision of the commission's examiner on the crude rubber price basis, claiming that adjustments had been made on commodities that did not show the substantial increase in volume of importations and the decline in value that crude rubber had in the last 10 years.

"At the time of the Goodyear case, crude rubber was 57 cents a pound, while in 1928 the average price of crude rubber was 22½ cents a pound," Colquitt said. "It is the consensus of opinion among the best minds in the industry that the price of crude will remain stable upon a lower level, due to increased plantation acreage and other reasons."

Colquitt cited to the commission a long list of commodities of virtually the same value as crude rubber, which are classified in the fifth class.

"The rubber industry must be granted its rights," Colquitt concluded, "especially in view of its present economic struggle. Crude rubber must be given the same rating as other commodities of like value. It is easy to handle and profitable to the carriers."

Goodyear Tire and Rubber Contracts To Use Minor Vulcanization Process

IT IS understood that a contract has been entered into between the Goodyear Tire and Rubber Company and the Liquid Carbonic Corporation of Cleveland whereby the former company will use the new patent rubber curing process, known as the Minor process, which has been held by the latter concern. An article describing this new process of vulcanizing rubber goods by the inventor, Henry R. Minor, was published in THE RUBBER AGE of September 10, 1929.

The contract permits the Goodyear company to use the process but the licensing is not exclusive to that company. The Liquid Carbonic Corporation is not to receive payments on a royalty basis, it is understood, but will be the exclusive supplier of all the gas to be used in the process. The Goodyear company is not scrapping its present curing processes but is setting up equipment in the Akron factory with which to give the new method an exerimental trial. The company expects to reduce the curing time about 42 per cent as a result of the new process and anticipates that it will lend itself particularly advantageously to the curing of the larger size tires where at present much difficulty is experienced.

The curing under the new process is accomplished by bringing the rubber into contact with heat and inert gas under automatic pressure control.

This method consists of subjecting the goods to be cured to heat within a closed chamber, the degree of heat being controlled by the inert and non-oxidizing gas, which in turn, is pre-heated through the utilization of part of the externally applied heat. The withdrawal of a portion of the outer heating medium effects the circulation of the remainder and a greater transfer of heat to the mould.

Intercontinental Rubber Company Reports $87,914 Loss During 1929

THE Intercontinental Rubber Company has reported a loss of $87,914 for the year of 1929, as compared with a net profit of $190,348 for 1928. Profit from operations totaled $97,639, as against $427,091 during 1928. President George H. Carnahan stated that a condition of depression in the market for all crude rubber continued throughout the year.

Mr. Carnahan reported that one of the company's more favorably located Mexican factory units has been kept in production on guayule and that planting in California continues, the area set out in the first two months of 1930 being about 2,000 acres. Production on the younger areas of the Sumatra plantation has not been pushed, but 1930 output will be about 1,500,000 pounds of crude rubber.

(Other news of the industry will be found on Pages 663-669)

Rubber Manufacturers Show Better Balance Sheets

Company Statements Indicate a Marked Improvement Over 1928, But Prove the Industry Is Still Far From Actual Prosperity

WHILE indicating far better results than were shown after the crude rubber deflation of 1928, the financial statements of the leading rubber companies for the year just past show the industry in the United States still a long way from true prosperity. An unbalanced condition is to be found in the fact that three of the five largest rubber manufacturing companies report profits for 1929 averaging about 6.3 per cent of their total sales, while the other two continue with appreciable deficits.

As a group, the "Big Five" of the domestic industry show total net profits of $24,162,684 during the year 1929. Although far above the 1928 total of only $1,840,375, this figure is well below the results obtained in previous years by the same companies. These five firms reported total earnings of $52,047,711 in 1927; $33,602,062 in 1926; $73,969,533 in 1925; and $39,205,432 in 1924.

Gross sales of all but two companies of the "Big Five" increased last year, despite the decline in unit prices on most items. In the three-year period from 1927 to 1929, however, their total sales of $2,358,120,563 were not greatly higher than in the three-year period from 1924 to 1926 when their sales totaled $2,115,122,808. Profits, on the other hand, shrank from $146,777,952 in the 1924-26 period to only $78,050,770 in the 1927-29 period.

The accompanying table shows the relation of gross sales to profits for each of these five companies. The profits listed are those remaining after interest, taxes, depreciation of plant and equipment, adjustments of inventories and other charges have been deducted, but before preferred dividends have been met, and include any reserve which may have been set aside. The table gives the same figures for the last three years by way of comparison.

The gross sales of the "Big Five" during 1929 totaled $811,060,343 or 70.7 per cent of the $1,146,918,000 which the Rubber Manufacturers Association, Inc., estimates as the grand total sales value of all rubber goods shipped from American factories last year. Besides being, therefore, fairly representative of the general condition of the industry in the United States, these figures show how the process of concentration of the country's rubber business into a few companies is going forward, as the "Big Five" sales in 1928 were only 65 per cent of the country's total.

The United States Rubber Company has experienced unusual expenses in connection with its intensive effort to reorganize its manufacturing facilities completely. The company's operating profit last year was $14,385,814 as compared with $14,530,711 in 1928, averaging about 7½ per cent of sales in each year. The fact that $18,336,000 of 7½ per cent notes, which, being due August 1, 1930, are carried under the company's current liabilities, is attracting attention at the present time. It appears likely that the company will resort to some form of temporary financing, either through the banks or through an issue of short term notes for at least part of the funds necessary to redeem these notes.

The Goodyear Tire & Rubber Company, the B. F. Goodrich Company and the Firestone Tire & Rubber Company appear to have finished the year in excellent condition, although the Firestone statement, being for the twelve months to October 31, does not give effect to the business recession of the last two months of the year. Goodyear showed the best ratio of profit to sales in 1929, taking this honor away from Firestone which had held it since 1926.

The Fisk Rubber Company's balance sheet shows current assets of $25,205,515 and current liabilities of $2,394,962, a ratio of 10.5 to 1. If, however, $8,199,500 of notes maturing on January 1, 1931, are treated as current liabilities, the ratio becomes only 2.38 to 1. According to H. T. Dunn, president, the introduction of the new Airflight tire line made it necessary for Fisk to replace its mold equipment entirely last year.

Among the smaller companies, General Tire & Rubber showed a slightly reduced profit of $1,970,000 and Mohawk a sharply cut profit of $216,327. India Tire & Rubber showed a net profit of $80,967 as against a net loss in 1928 of about $248,000, and the Lee Rubber & Tire Corporation increased its earnings to $485,930. The Kelly-Springfield Tire Company cut its 1929 loss down to $1,346,418 and shows a fairly healthy condition. Raybestos-Manhattan, Inc., had a net of $3,206,294, and the Thermoid Company earned $853,623, but neither of these is engaged solely in the rubber manufacturing business.

SALES AND PROFITS OF THE FIVE LARGEST RUBBER MANUFACTURING COMPANIES

(Profits shown are after interest and other charges, but before preferred dividends or reserves)

	1927			1928			1929			Three Year Total		
Company	Gross Sales	Profits**	Per Cent	Gross Sales	Profits**	Per Cent	Gross Sales	Profits**	Per Cent	Gross Sales	Profits**	Per Cent
U. S. Rubber	$193,442,945	$ 6,232,052¶¶	3.2	$193,480,121‡	$10,781,254†	....	$192,962,040‡	$ 3,378,412†¶	....	$579,885,106	$ 7,927,614†	....
Goodyear	222,178,540	16,635,666	7.4	250,769,208	10,827,843	4.3	256,227,067	19,864,374	7.8	729,174,815	47,327,883	6.5
Goodrich	151,684,960	12,780,306	8.4	148,805,178	3,513,023	2.4	164,494,957§	7,446,310§	4.5	464,985,095	23,739,639	5.1
Firestone*	127,696,759	13,780,966	10.8	125,664,666	7,072,014	5.6	144,585,804	7,726,870	5.3	397,947,229	28,579,850	7.2
Fisk	72,404,002x	2,620,721	3.6	60,933,841	8,791,251†	....	52,790,475	7,496,458†	....	186,128,318	13,666,988†	....
Total	$767,407,206	$52,047,711	6.7	$779,653,014	$1,840,375	.2	$811,060,343	$24,162,684	3.0	$2,358,120,563	$78,050,770	3.3

*Firestone fiscal year ends October 31. **Without deduction of reserves taken into income account. ¶Does not include $666,044 profit from plantations. ¶¶Does not include $4,000,000 profit from plantations. xCovers 14 months due to change in fiscal year. †Loss. ‡Includes operations of Winnsboro Mills, Beacon Fall Shoe Company and Rubber Regenerating Company, Ltd., previously carried as investments. §Includes Hood Rubber Company and subsidiaries for four months.

Rubber Chemists Plan Big Program at Atlanta Convention

Rubber Division, A. C. S., to Meet April 7-11—Eighteen Papers Will be Read Covering Many Phases of Rubber Technology—

Hotel Biltmore, Atlanta, Ga., the Headquarters of the A. C. S. Convention

AN extensive program calling for the reading of 18 papers has been formulated for the Rubber Division of the American Chemical Society when they hold their annual spring meeting at Atlanta, Ga., on April 7-11. The sessions will be held at the Hotel Biltmore, the official headquarters of the Society and will consist of half-day meetings on April 9 and 10.

Abstracts of the papers to be presented are given below:

Autographic Stress-Strain Curves of Rubber at Low Elongation

A. A. SOMERVILLE, J. M. BALL AND L. A. EDLAND, *R. T. Vanderbilt Company, New York City*

AFTER a brief discussion of present methods of obtaining strain curves on dumb-bell and ring test pieces a new method is described based on a new form of test piece. The new test piece is a molded loop 10 inches long and ¼x¾ inch in cross section, which has the following advantages: (a) The cross section is about 6 times that of ordinary test pieces and therefore gives more accurate readings, particularly at low elongations; (b) since each loop is molded no subsequent cutting is required; (c) flaws in the test piece are of no consequence; (d) every part of the test piece is stretching at a constant speed throughout the entire test.

Cross-strain curves are given for a pure gum and carbon black stocks showing the effect of the following factors: (a) increasing cure, (b) speed of testing machine, (c) mill grain, (d) flaws in test piece, (e) humidity, (f) temperature, (g) increasing loading of carbon black.

Structural Changes During Processing of Rubber

ERNST A. GRENQUIST, *Fisk Rubber Company, Chicopee Falls, Mass.*

THE effect of mastication, heating in air, in oxygen, in steam and in carbon dioxide gas, as well as the influence of light upon the plasticity of crude rubber has been investigated. Cold milling causes a permanent change in the consistency of crude rubber, whereas heating in air or in steam produces more or less temporary effect. In absence of air it seems that the rubber exhibits a maximum amount of disaggregation at each given temperature. At low temperatures the increase in plasticity proceeds with practically the same rate whether the rubber is heated in oxygen or in carbon dioxide. Ultra-violet light affects concurrently both the plastic and elastic properties of the rubber.

The correlation between elasticity and double refraction of crude rubber has been shown. The nisotropic properties of rubber parallel the recovery values. In this investigation there have not been met with any agencies, which cause as farreaching and profound destruction of the elastic properties of the rubber as prolonged physical mastication.

The interrelation between plasticity and structure of crude rubber has been studied and the fundamental difference between actual mastication and heat break down has been emphasized. Prolonged milling, heating in air, or in oxygen destroys the protein framework of the rubber. Heating in steam or in an inert gas leaves it more or less intact.

Thermochemistry of Vulcanization of Rubber

JOHN T. BLAKE, *Simplex Wire and Cable Company, Cambridge, Mass.*

THE heat of vulcanization of rubber by sulfur has been carefully determined over the complete range of combination. The formation of hard rubber is a strongly exothermic reaction, while the formation of soft vulcanized rubber is apparently without heat interchange, even in the presence of an accelerator. The vulcanization of rubber with m-dinitrobenzene and selenium is also without heat interchange and only soft vulcanized rubber is formed.

Kinetics of Vulcanization of Rubber with Sulfur and Selenium

JOHN T. BLAKE, *Simplex Wire and Cable Company, Cambridge, Mass.*

A METHOD for the determination of combined selenium in rubber has been evolved and a study made of the kinetics of the vulcanization of rubber with selenium. The formation of hard rubber under chosen experimental conditions has been put on a mathmatical basis and has been shown to follow the bimolecular reaction equation. The formation of soft vulcanized rubber and ebonite has been shown qualitatively to be successive reactions. The action of accelerators during vulcanization has been discussed.

Vulcanization of Rubber with Nitro Compounds

JOHN T. BLAKE, *Simplex Wire and Cable Company, Cambridge, Mass.*

A KINETIC study has been made of the vulcanization of rubber with m-dinitrobenzene and trinitrobenzene. The vulcanization has been shown to be a chemical reaction and to follow the monomolecular equation. A discussion of the molecular weight of rubber as estimated by stoichiometric methods is given. Nitro compounds are apparently incapable of vulcanizing rubber to form ebonite. The mechanism of vulcanization of rubber with m-dinitrobenzene is discussed.

A Theory of Vulcanization of Rubber

C. R. BOGGS AND JOHN T. BLAKE, *Simplex Wire and Cable Company, Cambridge, Mass.*

A NEW theory has been advanced which, it is believed, explains completely the various phenomena connected with the vulcanization of rubber. It is entirely a chemical theory based on the fact that two separate and distinct rubber compounds exist—soft vulcanized rubber and ebonite. The theory explains satisfactorily the aging of rubber, the variation in combined sulfur at optimum cure caused by acceleration, the kinetics of vulcanization, the

characteristics of various vulcanizing agents, and the thermochemistry of vulcanization.

The Surface Application of Age Resisters to Cured Rubber vs. Mill Incorporation Prior to Cure

W. L. Semon, A. W. Sloan and David Craig, *The B. F. Goodrich Company, Akron, O.*

THE protection afforded against accelerated aging was determined by applying representative hydrocarbons, organic acids, aldehyde amines, phenols, primary amines, alkaryl amines, and thiazines to a second grade tread stock. A comparison of surface application vs. mill incorporation was made in a high grade non-blooming tread, a high zinc blooming tread, a white mechanical stock, and a pure gum stock.

Efficient protection may be secured by either method; however, for high black stocks mill incorporation seems to give best results. It was shown that surface application will retard further deterioration even after considerable deterioration has occurred.

Early Stages of Oxidation in Rubber—A Quantitative Application of the Pyrrole Test

J. W. Temple, Sidney M. Cadwell and Morris W. Mead, Jr., *United States Rubber Company, Passaic, N. J.*

THE pine splint-hydrochloric acid test for oxidation products of rubber has been developed in a quantitative way. The technic and special apparatus are fully described.

Data from application of the test to a wide range of commercial stocks are given. Its use in following early stages of oxidation as they occur in accelerated aging of vulcanized rubber is described, and attention is called to an apparent difference between oxygen aging and heat aging. Evidence is cited that the substance which gives the test (presumably laevulinic aldehyde) is formed independently of, and previous to the actual physical deterioration of the rubber.

The Solubility of Oxygen in Rubber and Its Effect on the Rate of Oxidation

Ira Williams and Arthur M. Neal, *E. I. du Pont de Nemours and Company, Wilmington, Del.*

THE solubility of oxygen in rubber follows Henry's law and decreases with increasing temperature. The oxidation of rubber proceeds at a uniform rate as long as the oxygen concentration remains above a certain minimum. The concentration of oxygen in rubber exposed to air at 70° C. is less than that required to produce uniform oxidation at a maximum rate. High temperature appears to produce a type of oxidation which is affected by high pressure. The simultaneous use of high temperature and high pressure should be avoided.

3—Methyl—1, 3—Pentadiene

Harry L. Fisher and F. D. Chittenden, *United States Rubber Company, Passaic, N. J.*

A NEW set of reactions is given for preparing 3-methyl-1,3-pentadiene. Ethyl-methel-ketone and acetaldehyde are adoled to form 3-methyl-4-hydrox-2-pentatone, and this ketoalcohol is then catalytically hydrogenated to the corresponding glycol, which on being dehydrated forms the 1,3-diene. No 1,2-diene can form during the dehydration. Attempts to polymerize the 1,3-diene to a rubber-like product were unsucecssful. Therefore, the polymerization of 1,3-dienes to rubber-like products does not depend solely on the presence of a vinyl group.

Some Aspects of Double Refraction and Structure in Rubber

B. W. Rowland, *Goodyear Tire & Rubber Company, Akron, O.*

BOTH soluble and insoluble hydrocarbon phases may exhibit optical anistotropy upon distortion. Stretch is looked up as involving a two-phase mechanism wherein the soluble phase is forced into an orientation position within the gel phase and optical homogeneity results. Double refraction of both stretched and compressed rubber is interpreted as that of oriental rod-like micelles. Photographs of double refraction figures of compressed rubber are included.

The Effect of Curing Temperature Upon the Properties of a Rubber-Sulfur Mix

C. R. Parks, *Formerly Goodyear Tire and Rubber Company, Akron, O., and now with United Carbon Company, Charleston, W. Va.*

DATA are presented covering a range of equivalent cures at six different temperatures on a stock consisting of rubber 100, sulfur 6.25. Neither the original properties nor the aging behavior show any definite trend with increase of curing temperature. Comparison is made of natural aging to artificial aging as conducted in the Geer oven and the Bierer and Davis bomb. The temperature coefficient of vulcanization is determined by three methods to be 2.50/10° C. or 1.64/10° F.

The Moisture Content of Crude Rubber and Its Effect on Modulus of Cured Stock

S. C. Nicol, *Goodyear Tire & Rubber Company, Akron, O.*

THE moisture content of crude rubber has been divided into two classes, free and combined. A method of determination has been developed and the free and combined moisture has been determined on fifteen different samples of crude rubber. The different rubbers were compounded in two test formulas and the results correlated with the results of the moisture determinations. The following conclusions were drawn from the work:

(1) Total moisture and free moisture as determined according to the method here given do not have any connection with the physical or curing properties.

(2) There seems to be a definite trend in the relationship of combined moisture and modulus in the case of one formula.

(3) The correlation is not exact enough to warrant use in selecting rubbers.

A Method of Making Micro Sections of Rubber Stocks

Raymond P. Allen, *The B. F. Goodrich Rubber Company, Akron, O.*

THIS method has been developed to satisfy the need for a quick and convenient method of making thin sections of rubber stocks. A barely visible piece of rubber stock is cut with dissecting scissors and squeezed between a microscope slide and cover glass in a pool of molten beeswax and rosin. Held until the wax hardens, the rubber section is retained permanently thin. By this method, sections as thin as one micron or less can be made even of stiff rubber compounds containing 25 to 30 per cent of gas black. Sections may be made of either cured or uncured stocks.

Some applications of the method are mentioned. Illustrations show the method of preparing the sections. Six typical rubber pigments are shown dispersed in rubber stocks from which the sections have been prepared by this method. Several autochromes show interesting colored pigments. Among the latter is a slide showing the brown color of a thin section of a channel gas black stock.

The Behavior of Various Clays in Crude and Reclaimed Rubber

H. A. Winkelmann, *formerly of Philadelphia Rubber Works Company, Akron, O., now with Palmer Gas Products Corp.; and* E. G. Croakman, *formerly with Philadelphia Rubber Works Company, Akron, O., and now with Saylor Silica Company, Butler, Pa.*

THE maximum and minimum variations produced by a large number of commercial clays in crude and reclaimed rubber have been determined. Their effect on both the uncured and the cured products have been studied. The chemical analysis gives but little information regarding their behavoir in crude or reclaimed rubber. Clays show wide variation in plasticity, retentivity, and softness in crude and reclaimed rubber. They vary widely in their effect on the physical properties of crude and reclaimed rubber. Bomb aging is an important test for differentiating between various clays. In comparing samples of clays it is desirable to note their effect on the uncured as well as the cured properties of a compound.

The Effect of Pigmentation on the Work of Retraction of Rubber Compounds

F. S. Conover, *New Jersey Zinc Company, Palmerton, Pa.*

THE work of extension of rubber compounds has been defined as the work done during the elongation of the compound, and the work of retraction has been defined as the work done by the

rubber in returning from a stressed position to the point of zero stress. Work of extension is influenced by the kind and amount of pigment used, but the data show that work of retraction is independent of either of these factors. It is influenced, however, by the state of cure of the rubber.

Application of the Falling Cylinder to the Measurement of the Viscosity of Thick Rubber Cements

W. F. Busse and W. B. Doggett,
The B. F. Goodrich Company, Akron, O.

THE fall of cylinders through the surface of many thick cements may be represented with reasonable accuracy by the equation

$$t = k\frac{x^2}{Wn}\left[1+\frac{2n}{3}\frac{ax}{W}+\frac{n(n+1)}{4}\frac{(ax)^2}{W}+\frac{n(n+1)(n+2)}{15}\frac{(ax)^3}{W}+\cdots\right]$$

where t is the time of fall, x is the length of cylinder submerged, W is the weight of cylinder, a is the buoyant force on the cylinder when immersed 1 cm., and n and k depend on the flowing properties of the cement, k also being a function of the radii of the falling cylinder and the container. This equation was tested with cylinders varying from .0487 to 1.32 cm. in diameter, using liquids giving a 130-fold range in the time of fall. It held for castor oil and cements made of milled rubber, but not for thick cements made of unmilled rubber. A 15 per cent suspension of clay in oil acted very differently from rubber cements, as it showed a definite yield value and anomalous turbulence.

Falling cylinder viscometers were constructed of steel, and simplified formulas were derived for factory use. They were found very satisfactory for control and development work on many thick cements, and they could be used for control work with materials for which the above equation was not valid. These instruments are simple and easy to use, and should be of value in testing a wide variety of materials.

Carbon Black in Rubber Insulating Compounds

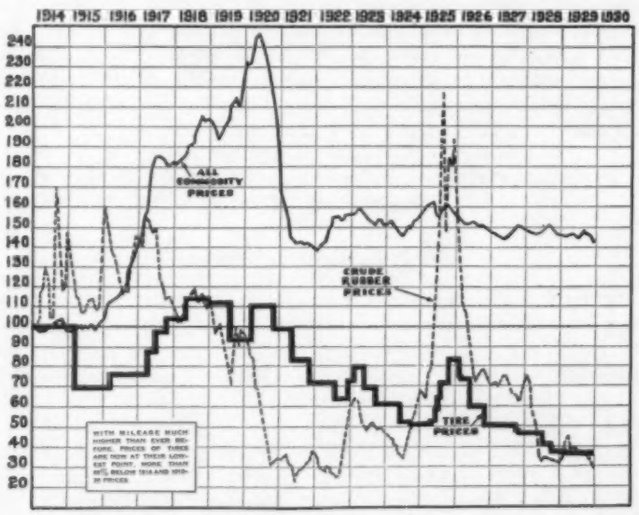
W. B. Wiegand, *Binney and Smith Company, New York, N. Y., and* C. R. Boggs, *Simplex Wire and Cable Company, Cambridge, Mass.*

RUBBER is a non-conductor or dielectric. Carbon black consists mostly of carbon, which is a conductor and so not a dielectric. Therefore the addition of the latter to the former must detract from its dielectric properties. Thus current belief, and thus the literature.

The contrary is the case. The admixture in suitable proportions of carbon black to rubber insulating compounds not only does not injure but may improve them, and to a striking extent.

Tire Price Comparisons

THE Goodyear Tire and Rubber Company have recently published a chart, as reproduced below, showing the relation of all commodity prices to the price of tires and crude rubber. It is interesting to note that while all commodity prices have maintained a fairly



constant level the prices of tire since 1919 have shown a distinct downward trend and at the same time were only slightly affected by sharp rise in crude rubber prices in 1925. With tires giving a much higher mileage than ever before prices are now at the lowest point in the history of the industry and more than 60 per cent lower than in 1919.

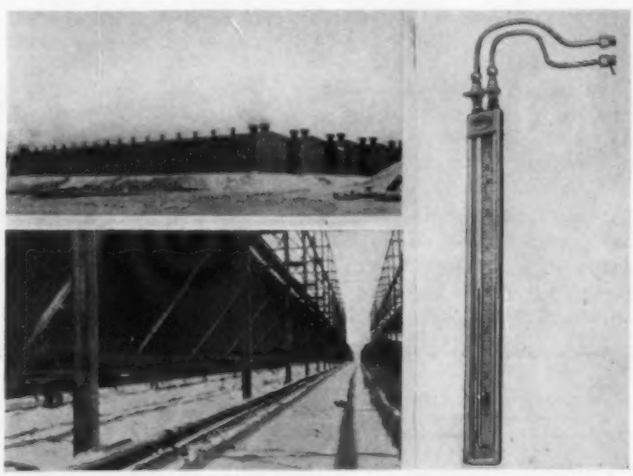
Scrap Rubber Dealers Meet

MEMBERS of the Scrap Rubber Division of the National Association of Waste Material Dealers held their annual meeting at the Hotel Astor, New York City, on March 19, under the chairmanship of David Feinberg. There were no special matters of importance taken up and no revisions in scrap classifications were made. The annual meeting of the Association was held the same day with the 17th annual banquet in the evening.

Measuring Flows from 200,000 Burners

IN the most modern method of manufacturing carbon black, where millions of cubic feet of natural gas are burned through thousands of gas jets, it has been found essential to maintain an accurate and constant check on the proper draft, rate of flow of the air and the pressure at which the gas leaves the burners. The importance of this will be readily recognized when the number of burners—from 40,000 to 200,000 per "house"—is taken into consideration. For this work the Meriam Company, of Cleveland, O., have a manometer consisting of a U-tube of accurate and uniform bore, mounted on a calibrated scale.

When used to indicate pressure, an arm of the U-tube



Above: Exterior View of Carbon Black Houses
Below: View in Incompleted House, Showing Scraper System for Removing Carbon Black From Steel Plates
Side: Manometer for Measuring Flow of Gas to the 200,000 Gas Burners in a Large House

is connected to each of the two points between which the pressure exists, and the total difference in liquid level in the two arms of the tube may be read off on the scale in pounds, inches of water, or whatever the scale may be constructed for.

Engineers Discuss Application of RUBBER *in Automobile Construction*

Cleveland Section of the Society of Automotive Engineers Hold a "Rubber Night"—Wide Expansion in Use of Rubber Predicted

AT THE meeting of the Cleveland section of the Society of Automotive Engineers, at the Hotel Cleveland on February 10, the evening was given over to a series of papers on the application of rubber to automobile construction. Abstracts of these papers have been released by the Society and are published in abbreviated form below.

Rubber Articulation

ROBERT F. CROWELL,
Mack Trucks, Inc.

THE considerations that entered into the designing of the application of rubber to the motor-vehicle were discussed and illustrated with lantern slides of drawings of different shock-insulating devices, including spring shackles, engine supports, torque insulators, body-panel insulation, and insulated seats.

Stock used for the shackles was developed by the rubber companies especially for the purpose after a great many trials before a compound was formed that stands up well in service. The stock should have a minimum tensile-strength of 2000 lb. per sq. in., and an ultimate elongation of 450 per cent. of its original length. Tests have shown that this stock will take a permanent set under a constant load of more than about 150 lb. per sq. in.

"Shudder-proof insulation" is a term applied by the Mack experimental engineering division to a standardized line of rubber cushioning developed for industrial machinery. This insulation can be applied to stationary-engine supports, in motor-vehicles, airplanes and boats or wherever the transfer of vibration from a source to another part must be stopped.

The torque insulator is inserted in the driving line, as between the clutch and transmission, and consists of four generously proportioned rubber cushions assembled into metal cups mounted on two arms, one driving and the other driven. A form of torque insulator has recently been developed for attachment to the rear wheels of a vehicle, the cushions being inserted between cast housings on the axle shaft and on the wheel hub.

Squeaks, rattles and drumming are eliminated from bodies by inserting rubber molding in the turned edges of body panels and putting it under displacement by clamping. Use of this method speeds up body production, as panels and stampings do not need to be formed so accurately as for welded or riveted construction.

Development and Properties of Hard Rubber as Used in Steering Wheels

T. T. KRAFT
American Hard Rubber Company

THE beginning and the development of the Husted hard-rubber steering-wheels as a safety measure were recountd.

Although hard-rubber steering-wheels had been introduced some 20 years ago, competition drove the price down to such an extent that the compound became of such inferior quality that the public did not want them. To avoid this condition, it was decided by his company that it would never reduce the quality of the rubber compound but would try mechanical and other means to get low cost.

The latest type of hard-rubber steering-wheel is a one-piece stamping consisting of a reinforced hub and tubular spokes and rim, and is coated with hard rubber of a high quality. The major difficulty that had to be overcome was to cause the rubber to adhere to the steel over the entire spider and to distribute the contraction of the rubber in such a way that during the cure the stress on the stock would be uniform throughout, since steel and rubber have considerably different ratios of expansion. To make sure that the wheels would withstand extreme temperature changes, tests were made at temperatures ranging from 50 to 130 degrees Fahr. Absolutely clean materials and extreme care in handling are essential to produce a rubber stock that will take and maintain an ebony luster and withstand exposure to the elements, perspiration, alkalies and rough usage.

Evaluation Tests for Rubber Vibration Insulators

FRANK D. ABBOTT
Firestone Tire and Rubber Company

TESTS applied to different rubber compounds in laboratory analysis to determine their suitability for the services to which they are intended to be put were discussed. The various tests, which were illustrated with slides of test apparatus and charts, include those for tensile strength, stresses at various elongations, hardness, resistance to aging, tear and cutting resistance, shear, adhesion, resistance to fatigue, deflectability under compression, impact, hysteresis properties and sound transmission. In the case of rubber vibrator-insulators, it is highly essential that the physical properties be evaluated only by tests simulating actual service conditions, particularly as regards frequencies and stressing.

The Compounding of Rubber in Its Relation to Use as an Engineering Material

V. A. COSLER
The B. F. Goodrich Company

THE extension of the use of rubber in industry in economical and rapid ways can be accomplished by closer cooperation between engineers in other industries and those in the rubber industry. The "hard-boiled" engineer knows all about metal alloys, babbitt metal and various other materials that can be bought in a large variety of combinations and will not buy steel unless he knows its physical characteristics down to the last fraction of an ounce, but he is vague about rubber combinations. Blame for this condition was laid upon the rubber companies for making a mystery of the subject of compounding.

Much of this mystery put into rubber by the compounder or rubber technician was revealed by descriptions of what materials the compounder works with and how he puts them together.

Numerous samples of rubber having different properties were exhibited and slides were also shown.

Rubber Inserts for Spring Shackles

H. S. POWELL
Powell Mufflers, Inc.

EXPERIMENTAL work in the developing of spring shackles with rubber inserts was discussed. The first of these rubber spring-shackles, designed with the object of silencing the shackles, were produced in 1923 or 1924, and have been in use ever since on a car that is still running. It was bumper rubber, which was inserted in a steel sleeve, after which a taper pilot was forced through the center. This worked well but was rather stiff because

of the density of the rubber and did not improve the riding-qualities of the car.

Further experiments resulted in the use of a lighter rubber, a center sleeve having indentations around it, and enlarging the outer ends of the bushing so that it curves in toward the center. This type has proved successful. It can be oscillated at 30 deg., 100 times a minute, without showing any wear.

Discussion

IN the discussion which followed, Mr. Mills, of the Gabriel Snubber Manufacturing Company, asked Mr. Abbott if he has any standard accelerated abrasion test for rubber and an accelerator test for resistance to oil. Mr. Abbott's answer was that he knows of no well-accepted accelerated abrasion test, although some people are working on the problem and possibly within a year a fairly satisfactory machine will be developed. Neither is there a universally accepted accelerated method of testing the resistance of rubber to oils. Mr. Cosler added that the customary way of checking against the effect of oil is to measure some characteristic, such as tensile strength or cross-section, before and after immersion in oil.

Ferdinand Jehle, of the White Motor Company, inquired if any flexible rubber hose is made that is really good for conveying oil up to a temperature of about 200 degrees Fahrenheit. Mr. Cosler's reply was not encouraging.

Mr. Abbott suggested that some sort of compression test might be valuable in evaluating rubber before and after oil absorption, to which Mr. Cosler responded that such a test is an indirect tensile-strength test and the size of the test specimen determines the distribution of the force causing distortion. He thinks a tear test is more indicative of the amount of deterioration due to oil absorption.

A. K. Brumbaugh, of the White Motor Company, was interested to know if there is any coating that can be put on tires to protect them from oil drippings while in storage. There are plenty of such coatings, said Mr. Cosler, but they have different characteristics than rubber and soon crack, thereby localing the action of the oil.

W. S. Howard, also of the White Motor Company, pursuing the same line of thought, sought to know whether there are any greases that will not injure tire castings when the grease drips out of bearings that are supposed to retain it. Mr. Cosler's reply was, "Adequate, or any of the water suspensions of graphite." He added that castor-oil is not highly deteriorating; the mineral oils in general are the most deteriorating in their action.

Ages and Yields of Rubber Trees

AN analysis of the ages and yields of rubber trees based on statistics collected from plantations in Java and Sumatra has been recently made by T. A. Tengwall and published in the *Rubber Age,* of London. Production plotted against age of plantation shows a rapid increase from the fifth year, the increase continuing good but steadily diminishing for five to six years. From the twelfth to the sixteenth year the increase is small and thereafter a decrease was noted which continued at a slow rate until the twenty-fourth year when the data ends. Several factors causing decline in yield, independent of age, particularly in connection with former estate practices, include clean weeding which resulted in soil erosion and poor bark renewal, and the heavy tapping systems which formerly had serious effect on bark consumption. It would appear difficult, therefore, to say definitely that a rubber tree passes its prime as a producer in its sixteenth year.

Others have tackled the question without conclusive results. Bodde (*Nederlandsch-Indisch Rubbertijds,* 1921) found a big decline in production after the eleventh to twelfth year, and Maas (*Archief,* 1925) agreed as to the age limit but found the decline very slight. He subsequently, however, renewed his studies and found increase in yields up to the sixteenth year when his data ended. Voight (*Gummi-Ztg,* 1926), however, reported excellent yields in Malaya from trees 30 years old.

Well-Known Retail Rubber Store

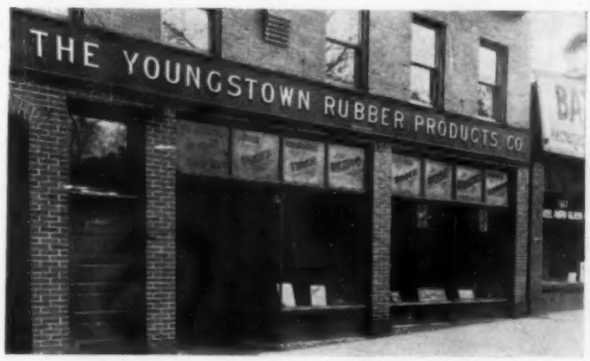
AN EXCELLENT example of a well conducted retail rubber goods store is the establishment of the Youngstown Rubber Products Company, 615 Market Street, Youngstown, O. The company was organized and incorporated under the laws of Ohio in 1920.

Their business is confined to the distribution of mechanical rubber goods, pneumatic tires and tubes, solid commercial and industrial tires, rubber and oilskin clothing, rubber aprons, and rubber boots. They are represented in the territory of Mahoning, Trumbull, Colubiana and Ashtabula in Ohio, and and Lawrence, Mercer and Crawford Counties in Pennsylvania. The organization is in charge of George A. Voorhies and W. F. Burr, whose biographies are given briefly below.

W. F. Burr and G. A. Voorhees

W. F. Burr started in the rubber business with Diamond Rubber Company in 1908, and later with Goodyear Tire & Rubber Company in the sales division at Akron, Ohio; in 1928 joined the Youngstown Sales Division of the Republic Rubber Company, and became interested in present business in 1920.

George A. Voorhies started with the Republic Rubber Company Factory, Youngstown, Ohio, in a factory clerical capacity in 1911, and in 1912 advanced to the Factory Sales Office in the Mechanical Goods Division where he continued until October 1, 1915, when he was transferred to Pittsburgh office. He continued travelling in the Ohio territory until the organization of his present company. The concern is the distributor for the Republic Rubber Company, of Youngstown, O.



The Store at 615 Market Street, Youngstown, O.

Comparative Exports of Rubber Footwear from United States, Canada and United Kingdom

Calendar Year	United States	Canada	United Kingdom	Total
	Pairs	*Pairs*	*Pairs*	*Pairs*
1928	9,642,097	9,422,541	3,249,768	22,314,406
1929	13,094,861	11,609,834	4,125,432	28,830,127

A Collection of Relics of Charles Goodyear

United States Rubber Company Has Gathered Together Many Articles and Documentary Memorabilia Associated With His Life and Times

Goodyear's Table and Portrait by Healy

IT WAS just about 100 years ago that Charles Goodyear first became interested in rubber, although it was not until 1839 that he discovered his famous vulcanization process. The years between was a period of trials and hardships for him. In 1939 it is planned to hold a centennial celebration in his honor. Volumes have been written around his life and the momentous achievement he gave to the world but there are few relics or mementoes of his existing which would make the picture of the man and his struggles more vivid.

The United States Rubber Company has slowly been accumulating a very interesting exhibit of Goodyear relics and historical documents and memoranda and has literally combed New England and other sections where Goodyear lived in search of personal possessions and other material associated with his life. These relics for the most part have found their way to the company's offices in New York and are being arranged suitably for display.

In the reception room of the president of the company, on the 20th floor stands an inlaid table of exceptional beauty. It was especially constructed by Charles Goodyear and inlaid with highly polished rubber. It was exhibited at the exposition in the Grand Central Palace, London, in 1851. At this exposition Goodyear was awarded a gold medal for his exhibit of rubber products. Incidentally, Goodyear had a strong enthusiasm for furniture with surfaces of highly polished rubber and firmly believed that furniture of this character would furnish one of the chief outlets for rubber in the future.

Hard Rubber Trays, Rubber Handled Knives and Medalion Frames of Hard Rubber Owned by Goodyear

Also in the reception room is the famous oil painting of Goodyear by G. P. A. Healy. The portrait is probably the only authentic likeness of Goodyear in existence. The painting is one of high artistic quality and for a number of years it was in the collection of the Brooklyn Museum. The portrait is flanked on either side by cases containing canes of rubber, also made by Goodyear.

In another room is the case of other Goodyear relics, shown in the accompanying illustration, containing two knives of Sheffield steel with hard rubber handles, a hard rubber tray of very fine workmanship, a tie pin of hard rubber and two medalion frames. In the case also is a memorial medal, struck off by the Hamburg Rubber Company, of Hamburg, Germany, at the time of Goodyear's death in 1860.

Among the valuable and interesting documentary relics preserved is the original agreement entered into by Goodyear and the licensees of his famous patent whereby he reduced the amount of royalties in return for the establishment of a fund to defend his patents. The case was the celebrated one of Goodyear vs. Day. Daniel Webster appeared for Goodyear while Rufus Choate defended Day's claims. The case was decided in Goodyear's favor and turned the tide of reverses and hard times. Other interesting documents include a letter from Nathaniel Hayward to Leverett Candee transferring his rights under an old Goodyear license to L. Candee & Company, a memorandum of Nathaniel Hayward telling of his part in the vulcanization invention and numerous letters from members of the Goodyear family.

The house at Woburn, Massachusetts, where the original experiments culminating in the discovery of vulcanization were performed, is still standing but has been remodelled so that the appearance of the original has been lost. His days at Woburn were dreary ones and he was often on the verge of despair. At times he was so poor that the neighbors had to feed his family. He was ill, in debt and regarded as a fanatic. On one occasion after a desperate attempt to secure financial relief in Boston, he walked home to find his two-year-old child dying. It died the next day and was carried to the cemetery in an express wagon. He even sold his wife's handwoven linens and his children's books to get money to continue his experiments.

All this poverty and disaster he met with a quiet stoicism and maintained the dignity and innate refinement of a gentleman. Fortunately, before he died he enjoyed the rewards of his achievements and in the closing years of his life he was receiving handsome returns from the licenses granted under his patent. His estate at the time of his death amounted to a quarter of a million dollars.

*Official Survey of the Consumption and Stocks of Rubber in the U. S. at the End of 1929**

Department of Commerce Gives Out Final Figures and Reconciles Discrepancies Between Rubber Manufacturers' Monthly Statement and Government Totals.

THE total consumption of crude rubber and reclaimed rubber in the United States during 1929, as determined by the Rubber Division with the cooperation of manufacturers who submitted reports, compares as follows with preceding years:

United States Rubber Consumption

	Crude Rubber Long Tons	Reclaimed Rubber Long Tons	Ratio of Reclaim to Crude Per Cent
1925	388,000	137,000	35.3
1926	366,000	164,500	45.0
1927	373,000	189,500	50.8
1928	437,000	223,000	51.0
1929	467,400	212,700	45.5

The percentage use of reclaimed rubber declined 5.5 per cent in 1929 to about the ratio of 1926. Considering the relative prices for crude rubber in the two years, it is apparent that the use of reclaims has been well maintained. Large supplies and low prices of raw rubber have reduced the actual quantity as well as the percentage use of reclaimed rubber, but during 1929 reduced the gross volume of the reclaiming industry's output only slightly. With exports of 12,369 tons of reclaimed rubber during the year, the 1929 production was about 225,000 long tons.

The monthly statistics of the Rubber Manufacturers' Association, Inc., for 1929, report a total production of 188,448 long tons of reclaimed rubber (83.75 per cent complete), and a total consumption of 159,115 long tons of reclaimed rubber (74.80 per cent complete).

In arriving at the 1929 consumption figures for crude rubber and reclaimed rubber, certain estimates in addition to the actually reported consumption were necessary. The consumption actually reported in the present survey was 460,321 tons of crude rubber and 206,722 tons of reclaimed rubber. There were 414 firms reporting crude rubber consumption and 290 firms reporting reclaim consumption. The total number of reports received from active firms was 421, and the number of separate establishments covered by their reports was 474, including subsidiary manufacturing plants. Included in this consumption are reports from 36 small companies which filed reports in 1929 but not in 1928, consuming 425 tons of crude rubber and 290 tons of reclaimed rubber.

In addition to the reported consumption, it was necessary to estimate the consumption of 39 companies which filed reports for 1928 but not for 1929. That these firms are still active is known in several instances and may be assumed generally since the original questionnaire and two follow-up letters were not returned by postal authorities as "undeliverable." It has been assumed that consumption by these companies was the same in 1929 as in 1928, when they reported consumption of 3,916 long tons of crude rubber and 4,449 long tons of reclaimed rubber.

In addition to the above, some 30 companies which were active and reported consumption for 1928 reported their factories as inactive for all or part of 1929, the companies having ceased operating at various dates and many of them having been liquidated. No record of their 1929 consumption is available but considering the known dates when operations ceased for the more important of these firms and the general conditions during the year as a whole, it is estimated that, for 17 of the firms known to have been active at least part of the year, the unreported consumption in 1929 was about 1,100 long tons of crude rubber and 500 long tons of reclaim.

There have been some firms, usually small consumers of rubber but occasionally using perhaps 300 tons a year, which have not reported consumption figures to the Rubber Division for either of the last two years. The amount of such unreported consumption for 1929 is perhaps liberally estimated at 2,000 tons of crude rubber and 1,000 tons of reclaimed rubber.

Summary of Consumption

	Crude Long Tons	*Reclaim* Long Tons
Actually reported	460,321	206,722
Estimated for firms not reporting on basis of 1928 reports for firms active throughout 1929	3,916	4,449
On basis of 1928 reports for firms active part of 1929	1,100	500
Other firms not reporting	2,000	1,000
TOTAL	467,337	212,671

The above totals are intended to represent closely the actual weight of crude rubber and reclaimed rubber consumed in the United States in 1929.

Usually rubber statisticians desire to compare crude rubber "consumption" with the Government statistics of "net imports" of rubber, that is, the gross imports less re-exports, for purposes of calculating stocks on hand. "Consumption" as reported by manufacturers is based on the factory weight of the rubber. The Government "import statistics" are based on weights declared by importers and are usually taken from invoices prepared by foreign shippers. Hence the two sets of statistics are not exactly comparable. There is said to be a shrinkage of about one half of one per cent from the time plantation rubber is shipped from the Middle East to the time it is weighted in at Akron, and a higher shrinkage on wild rubber, for which the "weight after washing" may sometimes be reported by manufacturers as the "weight consumed." Study of the statistics of net imports in connection with consumption surveys for 1927 and 1928 indicates that a shrinkage or wastage factor of about one per cent is necessary to bring the import statistics into line with the consumption and stock figures available for those years. It is possible that the various allowances made in estimating the total 1929 consumption would balance the wastage factor, as similar allowances were not made in previous surveys. On the other hand, if a higher percentage of non-standard grades of rubber was imported in 1929 than previously (rolled brown and native rubber imports are believed to have been large during 1929) this shrinkage allowance might even need to be increased for that year. For statistical purposes it is better to raise the consumption figures one per cent than to reduce the import statistics by that amount.

Since this shrinkage factor has in the past affected the quantity of rubber on hand in the United States, it seems logical to consider it as a continuing factor, and to make allowance for it by raising the monthly consumption figures sufficiently to include rubber disappearing through shrinkage, or loss of weight, for purposes of calculating statistics of stocks of rubber on hand. Although a factor of one per cent has been regularly used as the shrinkage allow-

*NOTE.—Reprinted from *Special Circular No.* 2614 of the Rubber Division, Department of Commerce, issued February 26, 1930.

ance in this report, it is likely that this is a variable factor, and the correct percentage may be either higher or slightly lower than one per cent.

The monthly reports of the Rubber Manufacturers' Association, Inc., report a total 1929 consumption of 422,825 tons, which is 89.58 per cent complete as compared with the "total disappearance" shown above for 1929, and 90.46 per cent complete as compared with the actual weight of rubber consumed. Raising the Association monthly statistics to 100 per cent from 89.5816 per cent gives the result shown below for 1929; the 1928 figures have been raised from 89.9875 per cent, and the 1927 figures from 88.6185 per cent.

	1927 Tons	1928 Tons	1929 Tons
January	32,009	34,408	43,203
February	30,606	33,707	41,789
March	36,705	35,693	44,939
April	36,430	32,777	47,743
May	35,131	37,338	49,463
June	34,328	37,681	43,430
July	29,674	37,412	41,719
August	33,982	42,931	38,453
September	27,639	39,888	34,869
October	27,209	40,863	34,963
November	27,210	37,466	27,788
December	25,777	31,236	23,641
	376,700	441,400	472,000

In calculating stocks of rubber on hand in the United States, the majority of rubber statisticians start with the stock statistics reported by the Rubber Association at some given date, thereafter calculating monthly stocks by adding the net imports during the month which gives the total available for consumption, then deducting the consumption (basing the consumption figure on the monthly reports of the Association, which figure is raised to 100 per cent on the basis of the completeness of the last calendar years monthly figures when compared to the Rubber Division consumption survey for the year, plus consideration of changing conditions affecting the completeness of the figures) which gives a calculated stock figure for the end of the month. The starting point of calculations used by the Rubber Division has been the stock reported as of December 31, 1926, raised to 100 per cent in accordance with the Association's estimate. This figure is used with other statistics in the manner described in the following example (long tons):

Method Used in Calculating Stocks

1927	Stocks beginning month		*Official net imports		Total available		Consumption		Stocks ending month
January ..	72,510	+	42,107	=	114,617	—	32,009	=	82,608
February .	82,608	+	26,312	=	108,920	—	30,606	=	78,314
March ...	78,314	+	33,207	=	111,521	—	36,705	=	74,816
April	74,816	+	45,118	=	119,934	—	36,430	=	83,504
May	83,504	+	34,135	=	117,639	—	35,131	=	82,508

*Official monthly net import statistics are reported by the Rubber Division monthly circulars reporting crude rubber re-exports from the United States to foreign countries.

While this method gives stock statistics which disagree violently at times with those published by the Association, similar (not identical) methods of calculation are nevertheless quite generally followed by leading manufacturers. If the method used above is followed for the past three-year period, the month-end stock figures would be as shown below. It may be stated that some statistical calculations of stocks on hand, which omitted the shrinkage factor, or which started calculations at some date when the comparable figures were much higher than those shown above, resulted in showing over 135,000 tons of rubber on hand in the United States as of December 31, 1929. The following table is not represented as necessarily accurate for the actual quantities on hand, but it is believed to reflect with reasonable accuracy the monthly variations in available supplies.

Comparison of these calculated stock figures with Rubber Association statistics of stocks on hand (as reported, not raised to the estimated 100 per cent) will show that during 1927 and 1928, the amounts actually reported to the Association were higher than

Calculated United States Stocks of Rubber

End of	1927 Tons	1928 Tons	1929 Tons
January	82,608	102,426	76,173
February	78,314	100,134	95,715
March	74,816	101,909	97,167
April	83,504	105,307	101,944
May	82,508	97,081	100,956
June	79,875	84,967	96,347
July	86,317	75,917	95,742
August	83,684	61,813	92,686
September	86,309	58,725	90,729
October	87,226	59,529	91,806
November	96,635	55,909	105,115
December	99,282	65,454	122,062

the above figures except in January, November, and December of 1927, and December of 1928, while during 1929 the amounts actually reported to the Association were lower than shown above in every month, except April. Only in 9 cases out of 36 do the two sets of statistics agree within 3,000 tons, in 12 cases out of 36 the variance is greater than 7,000 tons. The above calculated figures averaged 3,626 tons less than the Rubber Association statistics (not raised) during 1927, 2,956 tons less during 1928, and 9,342 tons more than the Association statistics during 1929. On the basis of the "total disappearance" of rubber for 1927, the calculated stocks on hand at the end of that year represented 26.4 per cent, for 1928 the December 31 calculated stocks only represented 14.8 per cent of the disappearance, while the figure of 122,062 tons at the end of 1929 (if assumed to be nearly accurate) would represent 25.9 per cent; relatively the 1929 year-end stocks appear no higher than the 1927 stocks.

The December 31 stock figures reported by the Rubber Association raised to 100 per cent on the basis stated by the Association, have been: 1927, 100,130 tons; 1928, 66,166 tons; and 1929, 105,138 tons. While various discrepancies between the calculated figures and the figures reported by the Association appear during the year, these are usually fairly well corrected in the December 31 reports, at which time the majority of firms take an actual inventory of their stocks. Large discrepancies at the end of 1929 led the Rubber Division to undertake to secure statistics of total stocks on hand in the United States, in connection with the consumption survey, in order to establish a more definite starting point for stock calculations during 1930.

In calculating month-end stocks of rubber on hand in the United States during 1930, it would seem in the light of this survey, that taking the Rubber Association monthly statistics on crude rubber consumption as 90 per cent complete, and using these statistics in comparison with the Government monthly net import statistics, should give reasonably close results over the year as a whole. Changes in the number and importance of firms reporting consumption statistics to the Association might, however, alter this percentage at any time.

In this survey of stocks full cooperation was extended by the Rubber Trade Association of New York and the Rubber Exchange of New York, each organization circularizing its entire membership. Reports of actual stocks were received from 53 New York firms including dealers, importers, commission agents, and one bank (reporting stocks held for foreign principals), and practically all reports were promptly rendered. The total stocks on hand reported by these firms were 50,282 long tons, as of December 31, 1929. Some 60 other brokerage firms who were circularized with the questionnaire reported "no stocks on hand." All firms known to be associated with the crude rubber trade were circularized, but whether there are other firms holding stocks it is impossible to say.

Reports of stocks held by manufacturers were received from 381 manufacturers who reported a total stock of 67,127 long tons on hand December 31, 1929. About 35 manufacturers who reported consumption but did not report any stocks on hand were all very small companies which used in the aggregate only about 1,100 tons of rubber during the year and whose stock in the aggregate could scarcely have exceeded 200 long tons.

Several banks were asked to report stocks which they might be holding at the year end through financial arrangements with manu-

(Concluded on page 661)

Toxic Substances *in the* Rubber Industry

PART IX

By P. A. DAVIS, A.B., M.A., M.D.

Assistant Medical Director, Goodyear Tire & Rubber Company

AMYL ACETATE *and the* AMYL RADICAL

AMYL ACETATE $CH_3COOC_5H_{11}$, is an ester of amyl alcohol and acetic acid. It is commonly called banana oil and is a product of petroleum distilates. It is also made from amyl alcohol and acetates. It is a clear to slightly yellowish liquid which is readily volatile and with a pleasing odor of ripe bananas.

This indicates the formation of amyl acetate and in studying the toxic properties of organic compounds, it is necessary to study the groups combining to produce the compound. This is an acetic ester of amyl alcohol and in comparison with other acetic esters, we know that the acetic carboxilic group is not toxic, but the positive ion is the toxic producing part of this ester. A similar conclusion must be drawn with ethyl-acetate, but the ethyl ion is not so toxic as the amyl; and we would not expect ethyl acetate to be so toxic as amyl acetate. Theoretically this is true and practically it has been demonstrated in industry. Choose other groupings, for example C_2H_5OH ethyl alcohol and compare it with $C_5H_{11}OH$, amyl alcohol. We know from experiments and experience that amyl alcohol is very toxic and is one of the chief constituents of fusel oil which is extremely toxic. Much of the toxicity of the present day alcohol is due to the fusel oil present which has not been removed. Most acetic esters are good solvents for higher organic bodies of the gum and resin and cellulose bodies.

Amyl acetate and ethyl acetate are used in industry principally as solvents and for their volatility, thereby enabling thin films to be produced which dry readily. Their use is often in conjunction with other solvents as, acetone, alcohol and some of the benzol derivatives.

Industries Where Amyl Acetate Is Used

1. Rubber industry
2. Manufacture of certain lacquers
3. In jewelry manufacture
4. Incandescent light manufacture
5. Manufacture of oil-cloths
6. Shellac and paint removers
7. Where cellulose coating of fabric is done
8. Silk manufacture
9. Airplane manufacture
10. Manufacture of celluloid
11. Some book binders and leather manufacturers
12. Sometimes used as substitute in furniture polishes
13. Paint and enamel manufacture which contain cellulose or its derivatives ethyl acetate is occasionally used instead of amyl acetate and should be used if possible as it is cheaper and less toxic

Modes of Entrance Into System

1. Respitory 95%
2. Alimentary 4 to 5%
3. Skin—Very little as both amyl and ethyl acetates dissolve the skin oil and produce a dry and non-absorbing skin

About 95% of the volatile vapor is absorbed thru the respiratory system by inhalation.

A small amount is absorbed by the saliva and oral secretions and swallowed, but this is not sufficient by itself to cause any systematic damage. The use of amyl acetate in the rubber industry is chiefly that of a solvent for cellulose and nitro-cellulose in the impregnation of fabric and in nitro-cellulose enamels.

These operations require the use of much heat in the form of coils over which the fabric is passed for purposes of drying and impregnation. The atmospheric conditions must be correct for the success of the process, and, therefore, correct ventilation is quite a difficult problem, but can be accomplished by heated and moistened air as controlled by a barometer.

All individuals working in the spreader room, cement house or other places where amyl acetate is used are given periodic examinations and are removed or transferred if any condition develops that may be due to amy acetate fumes.

The following is an average summation of the symptoms noted and complained of by the individuals as well as conclusions drawn from blood examinations. The symptoms should be described in two parts.

Symptoms Produced

First: Those which the individual notices on first coming into an atmosphere of amyl acetate.

1. Slight burning sensation of eyes with the production of tears
2. An irritation of throat without the production of secretions
3. Development of a dry choking cough which is continuous while in the fumes
4. Slight feeling of "largeness of the head" with a latter "pounding or pulsation"
5. A severe headache develops after some time which is not relieved by ordinary treatment but disappears after complete aeriation
6. Often times individuals get dizzy and faint
7. Nausea
8. Increased pulse and occasionally fast respirations

Not all individuals experience these symptoms, and those who do not usually are never troubled with amyl acetate as it is used in industry, except for a few symptoms which develop after they have worked in it for a year or more. Most all individuals become accustomed to the fumes of amyl acetate after a few days and may work in the fumes in their diluted condition for long periods of time, some never showing any ill effects, while others show some, and it is these symptoms which form the second part of the symptom complex.

Second: The following symptoms usually are only present after long periods of exposures to the fumes of amyl acetate.

1. Congestion of mucosa of eyelids and slight congestive areas of the eye-balls
2. Drowsiness and tired feeling at end of days work
3. Slight congestion of membranes of throat
4. Dry, hacking cough
5. A feeling of tightness in chest, or as some say a feeling as if a weight was on the chest
6. Headache—(throbbing or pulsating)
7. Unstable equilibrium and sometimes a gait as if intoxicated
8. Nausea and loss of appetite
9. Loss of weight
10. Anemia—pallor
11. Nervousness with paraethesias and occasionally ataxia.
12. Albuminuria
13. Tachycardia with increased B. P.
14. Capillary bronchitis

No deaths have been recorded where there has been complete autopsies and complete histological reports made.

The blood findings which we have a record of point to the following changes:

6% of bloods had a hemoglobin of 75% and below
42% of bloods had Erythropenia to as low as 4,000,000 with a hemoglobin of 75%
30% showed a leucocytoses above 10,000
33% showed an increase in Poly's above 75%
50% showed macrocytes from 3 to 9%
26% showed Transitionals
15% showed Eosinophils

A study of the blood picture does not give us any definite or specific fact as to a diagnosis except a slight toxemia and the degree of involvement in a period of a year or more is so small that it can only be used as an index of the anemia present. However, the consistency of some of the factors is very interesting, and one might state that amyl acetate or other compounds containing the amyl radicle produce a macro-cytosis with transitionals and an increase in poly-morphnouclears with a subsequent erythropenia in cases where absorption is at the toxemic state.

But for practical purposes this fact should only be used in conjunction with other factors.

Factors Which Control Physical Conditions

1. Proper selections of personnel. This is controlled more or less by the labor departments, but certain factors should be dominant. Individuals with the following physical defects should not be placed in departments where amyl acetate or any other amyl compound is used:

1. Tuberculars or any others with any pulmonary condition including chronic bronchitis
2. Chronic rhinitis of laryngitis
3. Hyper-tension
4. Tachycardia
5. Glaucoma and chronic conjunctivitis
6. Nephritis and diabetes
7. Dermatitis
8. Gastritis-ulcer of stomach
9. Anyone with defective equilibrium
10. Anemic individuals
11. Nervous individuals

2. Proper working conditions should be maintained. Under this factor a close co-operation between the department head, safety engineer, and the personnel should be maintained.

Proper ventilation should be instituted and this should be both forced and suction with heated and moistened air. Exhaust hoods should be placed over the operations, and all measures used to prevent the general diffusion of the fumes. Proper supervision should be maintained and any change in the solvents should be noted, or any undue exposure to fumes corrected.

Individuals who show anv idiosyncracy to the fumes of amyl acetate or other amyl compounds should be removed.

3. Periodic physical examinations. The frequency of these examinations depend on the amount of amyl acetate being used and on the length of time the individual is exposed to the fumes. We examine the individuals working in amyl acetate every 90 days and any one showing symptoms of any absorption are removed and placed where they will get plenty of fresh air. They are later permitted to return to their old jobs as removal for a short time causes a cure.

4. Proper instruction of the individual and his supervisor as to the chemical and toxic nature of the substance with which he is working.

They will then know what not to do and this is often more sensible than to know what to do. The periodic examinations are extremely important as they give all the facts that must be known before a proper solution of some of the complaints can be made, and upon the findings depends the course of action as to the correction of the individuals physical defects.

Treatment

Prevention is the key note in industrial medicine. There is no specific treatment for amyl acetate poisoning, because there is very little of it to treat.

The symptoms of acute exposure pass away on complete aeration, and those that one comes in contact with during periodic examinations very readily clear up on removal from contact with the fumes for a short period. In some cases it is advisable to stimulate the execretory organs by some substances such as sodium citrate, magnesium sulphate and citrate of magnesia.

Iron and calcium are beneficial in the anemias.

Water and liquid nourishment should be forced in acute cases with collapse.

For headaches beware of acetanilid compounds, and use ice-packs.

For digestive disturbances the combination of bismuth subcarbonate, calcined magnesia and lactaled pepsin give good results.

If a tachycardia becomes alarming use an ice-pack and Tr Digitalis.

Other symptoms treat as they arise, but remember that air and oxygen are the best remedies both in acute and chronic symptoms.

Conclusion

Amyl acetate and amyl derivatives produce toxic symptoms as has been enumerated.

These conditions can be perfectly controlled by proper ventilation, supervision and periodic examinations and subsequent removal of anyone showing any absorption.

Our observations have shown that over long periods of time there is a definite blood change.

There is no specific treatment except removal and complete aeration.

That amyl acetate and amyl derivatives can be safely used if the previous noted facts are adhered to, and the concentration of the diffused vapors are kept at a minimum.

Card Abstract File of Rubber Literature

THE existence of a privately maintained abstract file of approximately 50,000 cards covering every important paper, publication and patent on rubber and allied gums from 1907 to date has recently come to the attention of the Editor. This file has been maintained by Dr. W. P. Bradley, president of Bradstone Rubber Company, Woodbine, N. J.

The origin of this voluminous work dates back to the time in 1912 when Dr. Bradley was in charge of the research laboratories of the U. S. Rubber Company. The file was started for his personal use in connection with his research work at that time and it has been kept up-to-date since then, even though it is of little use to Dr. Bradley in his present capacity.

The abstracts are arranged alphabetically by subjects and completely cross-indexed for easy reference. Following is a brief summary of the main divisions and subdivisions of the file:

1. Introduction—Abbreviations (ordinary abbreviations, periodicals, symbols); Periodical References (Chemical Abstracts, other periodicals); Classification of Rubber (Botanical, geographical, commercial).
2. Analysis, of or for, (69 divisions from accelerator to vulcanization); Apparatus (14 divisions from analysis to washing); Artificial Rubber; Compounding (31 divisions from asbestos to ZnO); Constitution; Decomposition; Imitation rubber; Insulation; Manufacture (63 divisions from air cushion to wire) Market; Miscellaneous; Oxidation; Patents (14 divisions from apparatus to vulcanization); Production (71 divisions from Africa to West Indies); Properties (23 divisions from abrasions to viscosity); Quality; Reclaimed Rubber; Reclaiming; Resin; Solubility; Solvents; Testing (40 divisions from abrasion to vulcanized rubber); Tetrabromide of Rubber; Tires; Tubes; Vitality; Vulcanization (27 divisions from Accelerator to water); Welfare.
3. Cross Reference—Everything mentioned in each abstract is cross-referenced by title, author, subjects, etc., with the page in "Chemical Abstracts" and other periodicals where the article first appeared.
4. Bibliography—a list of all books mentioned in "Chemical Abstracts" arranged alphabetically, each book also being listed under title and author, cross-referenced.

Accelerators *of* Vulcanization *and* Their Uses*

By FRIEDRICH EMDEN

EDITOR'S NOTE: *This is the second and concluding part of Dr. Emden's paper. The first installment was published in* THE RUBBER AGE *of March* 10.

THE guanidines are a series of commonly used accelerators, diphenylguanidine being by far the most popular, although it undeniably has poor qualities as awell as advantages. The guanidines used as accelerators may be divided into the di-substituted guanidines, the tri-substituted guanidines, and the biguanidines.

Di-substituted guanidines are generally formed by removing sulfur from thiourea by adding ammonia in the presence of metallic oxides (PbO, ZnO). The NH-group takes the place of the sulfur, H_2S being evolved.

Tri-substituted guanidines are obtained by heating the corresponding thiourea with aniline, H_2S being formed as a by-product.

The guanidine accelerators are white odorless powders. They are very stable when exposed to the air, and are not hygroscopic. The di-substituted guanidines are several times as active as the tri-substituted derivatives, and have much greater importance.

Guanidines are used for curing in steam, in water, or in the press. They may be used for light or colored compounds, although for pure white compounds other accelerators are advised, as the guanidines produce a yellow color on aging, especially in sunlight. Compounds containing guanidines have a relatively high critical temperature (about 110° C.) The curing curves of such compounds are not as flat as those containing aldehyde-amines. On the other hand guanidines produce vulcanizates with high modulus.

The activity of the guanidines is greatly increased by the presence of ammonia or substances forming ammonia at the curing temperature, such as ammonium salts and hexamethylenetetramine. The guanidines themselves increase the activity of other accelerators, although at the same time they lower the critical temperature considerably. The presence of zinc oxide is required to bring out the full accelerating strength. Among the mineral fillers, magnesium oxide and magnesium carbonate especially have a favorable effect.

39. D. O. T. G. (du P., R. H., Am. Cyan., D. C., R. S. L.) Di-*o*-tolylguanidine, sp. gr. 1.10, a white powder, melting point 173° to 175°C. It is only sparingly soluble in water, but dissolves pretty easily in warm alcohol, from which it crystallizes in needles on cooling. It is non-hygroscopic, odorless, does not bloom out, and causes less dust during compounding than does diphenylguanidine. Activity 1.2. Dosage 0.5 to 1.0. Not more than 3.8% sulfur should be used in blooming stocks, 2.8% being used in non-blooming goods, and 3.0 to 3.3% in carcass compounds. Accelerators of the formaldehyde-aniline type particularly are employed as softeners, about one-fifth of the D.O.T.G. being replaced by six or seven times as much of the other accelerator; however, the sulfur content must be increased at the same time though not over 4%. It is suitable for hard rubber goods, even without zinc oxide, though a higher percentage of accelerator is required (up to 3%).

40. D. P. G. (du P., R. H., Am. Cyan., D. C., R. S. L.), Vulkacit D. (I. G.), Vulkafor II (B. D.). Diphenylguanidine, sp. gr. 1.13, melting point 147° to 148°C. Activity 1.0. For all other properties and usage see D. O. T. G.

41. P. O. T. G. (du P., R. H., etc.), Portsmouth-Accelerator (P. D. C.). Phenyl-*o*-tolylguanidine, sp gr. 1.11, melting point 126° to 128°C. Activity 1.1. In all other properties similar to D. O. T. G. It causes less dust than D. P. G. In compounds containing considerable clay and reclaim it should show about the same activity as D. O. T. G.

42. T. P. G. (du P., R. H., etc.), Vulkafor III (B. D.). Triphenylguanidine, sp. gr. 1.13, melting point 141°C. Activity 0.4. Not used a great deal.

43. Vulkacit 1000 (I. G.) *o*-Tolylbiguanide, sp. gr. 1.10, is easily soluble in alcohol even cold, but is almost insoluble in water. In cold benzene it is almost insoluble, but becomes fairly soluble on warming. It is almost insoluble in naphtha even on heating. It is insoluble in rubber so that careful mixing is required. Activity 0.9. It causes considerable dust during mixing, but is especially recommended for compounds which come in contact with food.

44. Ultracene (formerly Ultracit, L. V.). Zinc derivative of cyanguanidine. It is not used in combination with other accelerators. Dosage the same as that of the sulfur, 3 to 4%.

V. Salts of Dithioacids.

Almost all the ultra accelerators belong to this class. They may be divided into the dithiocarbamates, dithiobenzoles, dithiophosphates, and xanthogenates, the dithiocarbamates being the most important.

Dithiocarbamates result from the action of carbon disulfide on secondary aliphatic amines. They are the most powerful accelerators that we know, but their critical temperature is usually so low that compounds containing them cure at room temperature on standing a few weeks. Consequently their application is limited to a special field, the preparation of self-curing cements. The vulcanization by heat of dipped goods, which is becoming more and more important, usually employs dithiocarbamates either in aqueous or benzene solution.

Safex is an exception among the dithiocarbamates in that it has an unusually high critical temperature (about 112° C.). The chemical constitution of this accelerator is particularly remarkable as it is the only one of all accelerators in actual use that contains a nitro group.

The zinc and lead salts of the dithioacids have a somewhat higher critical temperature than the condensation products of carbon disulfide and secondary amines and hence are often preferred. The lead salts especially have attained a certain importance as accelerators with a relatively high critical temperature in compounds containing litharge. Lead oxide is required as an activator.

The xanthogenates are derivatives of xanthogenic acid, an ester acid (for example $C_2H_5.O.CS.SH$), which in turn is derived from dithiocarbonic acid, CS-SH-OH, by esterifying the OH-group. They

*Translated by J. P. Fahy from *Kautschuk*, Nos. 11 and 12, pp. 241-244, 269-276 (1929).

are used but little, as for example in quick curing cements.

45. Aero-X (Am. Cyan.). Aniline-di-isopropyldithiophosphate, a semi-ultra accelerator, sp. gr. 1.22. A powder with a pungent smell.

46. Grasselerator 552 (G. C.), Pip-Pip (R. H.), Vulkacit P (I. G.), Suparac Standard (M. T. D.). Piperidine pentamethylenedithiocarbamic acid, yellowish white powder, melting point 160°C. Reaction product of carbon disulfide and piperidine. Vulkacit P is the pure undiluted piperidine derivative; the other trade products contain more or less clay. The accelerator smells of piperidine, is easily soluble in water, benzene, and alcohol, but is insoluble in naphtha. Without zinc oxide it is a moderately strong accelerator; with a minimum of 3.5% zinc oxide it is the strongest of all the accelerators. Compounds containing Vulkacit P vulcanize in a few minutes at 7.5 lbs. steam pressure, in a few hours at 70° to 80°C., and in a few days at room temperature. It is especially suitable for self-vulcanizing solutions of rubber, and for curing thin-walled articles by means of a water or benzene solution of the accelerator.

47. R 2 (R. S. L.). Reaction product of carbon disulfide and methylenedipineridine, a thin odorless, light colored oil, sp. gr. 1.0. Used like Vulkacit P.

48. Vulkacit 774 (I. G.). Dithiocarbamate of cyclohexylamine, a white crystalline powder, soluble in water. Almost as strong as Vulkacit P, and even stronger than it is in aqueous solution, hence especially suitable as a substitute for sulfur chloride. Thin walled articles which are composed of, for example, rubber, sulfur, and zinc oxide, (100:2:0.8) are cured in a one per cent solution of the accelerator in water at 85° C. in from 30 to 40 minutes.

49. Vulkafor VI R (B. D.). Diethylamine-diethyldithiocarbamate. Almost as strong as Vulkacit P, and especially suited for vulcanization in aqueous solution (see Vulkacit 774); a crystalline powder, melting point 83°C., soluble in water, alcohol, and benzene.

50. R 5 (R. S. L.). A dithiocarbamate in composition similar to Vulkafor VI R. Is soluble in water, and is used like Vulkacit 774 and Vulkafor VI R.

51. W 29 (D. C.). D. P. G. salt of dibenzyldithiocarbamic acid, sp. gr. 1.0; a powder with an aromatic odor. An ultra-accelerator used in quick curing cements.

52. Lithex (N. C.). Lead dithiobenzoate, precipitated on clay, sp. gr. 2.5. A powder used in conjunction with litharge (one part Lithex to four parts litharge). Has a high critical temperature.

53. Super-Sulfur No. 2 (R. T. V.). Lead dimethyldithiocarbamate, precipitated on clay. An ultra accelerator about as strong as a thiuram, but with a higher critical temperature. Suitable curing temperatures are: for air cures 127°C., or less, for press cures 134°C. or less. Litharge is used as an activator, and, like Lithex, this accelerator is used exclusively in compounds containing litharge. The addition of zinc oxide is recommended, and pine tar has a favorable effect. Three to five per cent of Super-Sulfur No. 2 is used and six to ten per cent litharge.

54. Vulkacit P extra (I. G.). Zinc salt of ethylphenyldithiocarbamic acid. A gray powder, insoluble in naphtha and alcohol, but fairly easily soluble in benzene. Zinc oxide is used as an activator, at least 3% being required. It is an ultra accelerator almost as fast as Vulkacit P, but less apt to pre-cure. It finds general application, especially in quick curing cements.

55. Zimate (R. T. V.). Oxidized zinc salt of dimethyldithiocarbamic acid. A white powder, whose properties and uses are similar to those of Vulkacit P extra.

56. Super-Sulfur No. 1 (R. T. V.). The same as Zimate, but precipitated on clay.

57. R 3 (R. S. L.). A zinc salt of a dithiocarbamic acid. Properties and uses same as those of Vulkacit P extra.

58. Vulkafor VI (B. D.). Zinc diethyldithiocarbamate, melting point 75°C., insoluble in water and alcohol. Properties and uses similar to those of the zinc salts described above.

59. Safex (N. C.). Dinitrophenylester of dimethyldithiocarbamic acid, sp. gr. 1.56, melting point 139°C. Deep yellow, crystalline powder, odorless, stable in the air, insoluble in water, soluble in benzene. Critical temperature about 112° to 115°C. A semi-ultra accelerator about as strong as mercaptobenzothiazole. Requires zinc oxide. Is generally used in press cures, and is suited only for dark colored compounds. Acidic materials raise the critical temperature, basic substances lower it.

60. Z. B. X. (N. C.). Zinc butylxanthogenate, a powder with a spr. gr. of 1.56. An ultra accelerator used in quick curing cements.

VI. Thiurams.

These are the other group of ultra accelerators, the dithioacids being the first. They are prepared by the action of carbon disulfide on secondary aliphatic amines, followed by oxidation, and are classed as monosulfides or disulfides. The special importance of these accelerators is due to their relatively high critical temperature, whence they have found extensive application in the manufacture of all sorts of rubber goods. The disulfides are distinguished from the monosulfides by the fact that the former contain sulfur which can be split off during vulcanization. Consequently it is possible with the help of thiuramdisulfides to cure compounds containing little or no sulfur, a process which is important in the manufacture of transparent rubber goods. Vulcanizates made with very little sulfur and relatively much thiuramdisulfide are especially resistant to long exposure to heat. Hence these accelerators are used in the manufacture of conveyor belts, brake hose, hot water bottles, steam hose, etc. Thiurams may be used for press-cures, water-, steam-, or air-cures equally well, and are also suitable for white, black, or colored compounds.

Thiuramsulfides are "poisoned" by the presence of lead oxide or other compounds of lead. However, if the compound contains only a trace of lead (0.1 to 0.5%), the critical temperature is merely lowered. This peculiarity of lead salts is used to render compounds containing thiuramsulfides less difficult to handle. The monosulfides have a somewhat higher critical temperature than the disulfides, but the time of cure in both cases is the same.

Thiuramsulfides are affected in various ways by the other substances present, whether organic or inorganic. The retarding action of gas black and reclaim especially may be mentioned. Stearic acid has a favorable effect.

61. Tuads (R. T. V.), Vulkacit Thiuram (I. G.). Tetramethylthiuramdisulfide, sp. gr. 1.4, melting point 145°C., a grayish white powder, insoluble in water, does not "fly" while mixing. An ultra accelerator with a critical temperature of about 100° to 102°C.

62. Vulkafor VII (B. D.). Tetraethylthiuramdisulfide, sp. gr. 1.4, melting point 70°C., a grayish white powder somewhat stronger than Vulkacit Thiuram.

63. Thionex (du P.), Monex (N. C.). Tetramethylthiuram-monosulfide, sp. gr. 1.4, melting point 103°C., a pale yellow powder with a critical temperature of about 105°C.

VII. Thiazoles.

Mercaptobenzothiazole is the only one of this class that has found extensive application. It is made by heating thiocarbanilide and sulfur, also by the direct action of aniline on carbon disulfide and sulfur in an autoclave. The resulting mass contains, in addition to the principal product, thiocarbanilide, aniline, and triphenylguanidine, and may be used as an accelerator without further treatment. Generally, however, the mercaptobenzothiazole is extracted with sodium hydroxide and subsequently reprecipitated by the addition of acid. The products offered to the trade are:

64. Captax (R. T. V.), Vulkacit Mercapto (I. G.). Both are pretty pure 1-mercaptobenzothiazole. Mercapto contains fewer impurities than Captax, as indicated by its fainter odor and higher melting point (Mercapto 175°-176°C., Captax 169°-170°C.). The accelerator is a pale yellow powder, sp. gr. 1.42, very slightly soluble in water, but soluble in alcohol, ether, chloroform, alkalis, and ammonia water. Has a very bitter taste. A semi-ultra-accelerator with an activity of about 1.6 to 1.8. Especially suited for compounds containing reclaim. Stearic acid has a favorable action. Curing temperature 125°C. and up. Requires zinc oxide—at least 3.5%. Dosage: in pure gum compounds 0.4% accelerator and 2.5 to 3.5% sulfur; in compounds containing gas black use up to 0.8% of accelerator. Compounds containing mercaptobenzothiazole have a flat curing curve and yield vulcanizates with low modulus. Aging properties excellent. Suited for press-, steam-, water-, or air-cures, and for white or colored compounds.

65. W 80 (D. C.). D. P. G. salt of 1-mercaptobenzothiazole, sp. gr. 1.0, a powder with an aromatic odor. It is a semi-ultra accelerator, requiring 3 to 5% zinc oxide. Stearic acid has a favorable effect. Generally used for all sorts of compounds.

VIII. Thiazines.

The only representative of this class known is the Vulcanol of the du Pont Company. Compounds containing Vulcanol are claimed to have the following valuable properties: high modulus, flat curing curve, good aging, and high critical temperature. Accordingly, Vulcanol combines the desirable properties of the disubstituted guanidines with those of the aldehyde-amines and mercaptoben-

zothiazole. Unfortunately, it also has disadvantages which prevent its use as a universal accelerator. White or delicately colored compounds cannot be cured with Vulcanol. Moreover, its activity is so much injured by gas black and clay that it is out of the question as an accelerator for tire-treads.

66. Vulcanol (du P.). 2-thioketo-3-phenyl-4. 5-dipropyl-6-propylidene-3, 6-dihydro-1, 3-thiazine (according to du Pont Bulletin No 8). Sp. gr. 1.06. A yellowish brown, thin oil with a slight odor, insoluble in water, sparingly soluble in naphtha and benzene, but very soluble in acetone. Critical temperature about 109°C. Curing temperature 116°C. and up. Requires at least 5% zinc oxide. Lead oxide retards the cure. Basic substances increase the activity but at the same time lower the critical temperature; acid substances have the opposite effect. The addition of stearic acid in moderate quantities (1%) is recommended. Brown factice in moderate amounts (5%) has a favorable effect and somewhat accelerates the cure. Vulcanol cannot be used in compounds containing much gas black or clay, but works very well in compounds containing reclaim. Dosage: 0.5 to 1.2% Vulcanol; 2.0% sulfur in non-blooming pure gum compounds, 3.5 to 4.0% in blooming compounds, 3% in carcass stocks. One part of Vulcanol corresponds to about three parts of Vulcone or ethylidene-aniline.

67. Vulcapont (du P.). A combination of equal parts Thionex and Vulcanol, mixed with clay. Contains 33.3% of accelerator. Has a lower critical temperature than Vulcanol, curing at temperatures above 109°C. Has a very flat curing curve, and is used in all sorts of compounds except pure white.

IX. Nitroso compounds.

68. Accelerne (H. H. R.), Vukafor I (B. D.). *p*-nitrosodimethylaniline, a greenish crystalline material, sold as a paste containing 50% of water. Poisonous. Suited only for dark compounds. Zinc oxide acts as an activator, but is not required. Used particularly in hard rubber goods. Has exceptional aging properties. Is still used in England to a limited extent.

X. Accelerators of unknown composition.

69. Chinoidin (A. B. N. K.). A mixture of various alkaloids of cinchona bark, a brown resin, which becomes plastic on warming. Sticks easily to the mill, so that the preparation of master-batches is advised. Activity 0.5. Cannot be used in white compounds, but works well with reclaim and brown factice. Odorless, non-poisonous, critical temperature about 110° C. Zinc oxide is used as an activator. The accelerator may be used in the presence of litharge, or calcium or magnesium compounds. Dosage 0.5 to 2.0%.

70. Thermlo "F" (R. H.). An organic polysulfide. A powder with a sweetish odor. A semi-ultra accelerator.

71. W 87 (D. C.). Yellowish white, wax-like mass (containing mercaptobenzothiazole?), becoming fluid on warming at 100° C. Has a wide range of curing temperature, from 125° C. up. Has good aging properties. Three to five per cent zinc oxide is required. Dosage: 0.5 to 0.8%; in compounds containing gas black or clay 1 to 1.5%. For weakly blooming compounds use 3.0 to 3.5% sulfur, for non-blooming compounds 2.0 to 2.5%. Pine tar retards the cure somewhat, antimony sulfide retards it considerably. Activity about 1.4.

72. Z 88 (R. S. L.). Basic reaction product of a mercaptan, sp. gr. 1.22. A wax-like accelerator of moderate activity.

73. Ureka (R. S. L.). A yellow powder with a slight odor. An ultra accelerator with a high critical temperature, suited for all sorts of dark compounds and any type of cure. Dosage 0.5 to 2.0%.

NOTE

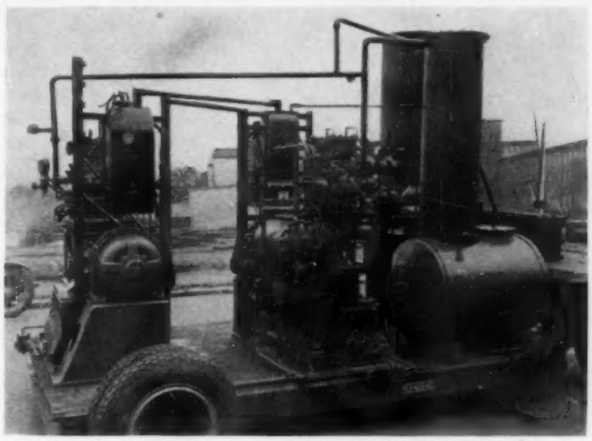
The names of the companies manufacturing the accelerators mentioned which were abbreviated throughout the article are as follows:

I. G. Farbenindustrie A.-G.
D. C.—Dovan Chemical Co.
R. S. L.—Rubber Service Laboratories Co.
B. F. G.—B. F. Goodrich Co.
N. C.—Naugatuck Chemical Co.
B. D.—British Dyestuffs Corporation.
L. V.—Lehmann & Voss.
A. B. N. K.—Amsterdamsche, Bandoengsche und Nederlandsche Kininefabriken.
M. T. D.—Midland Tar Distillers.
du P.—E. I. du Pont de Nemours & Co.
R. H.—Roessler & Hasslacher Chemical Co.
R. T. V.—R. T. Vanderbilt Co.
G. C.—Grasselli Chemical Co.
Am. Cyan.—American Cyanamid Co.
A. C.—Anchor Chemical Co.
P. D. C.—Portsmouth Dye & Chemical Co.
H. H. R.—The Hooley Hill Rubber Co.

Mobile Helium Plant

A HELIUM repurification plant of a mobility hitherto unattained has recently been designed for the Goodyear-Zeppelin Corporation, of Akron, Ohio, by the Helium Company, of Louisville, Ky. The entire plant with a capacity of 1,500 cubic feet of gas per hour, is mounted on a pneumatic-tired trailer body, and can traverse any terrain which a truck can negotiate.

The new truck trailer plant has the obvious advantage of ready transfer to the side of an airship or blimp wherever



the latter may be. The purification process comes to the airship, rather than the airship to the purification process.

The mobile plant is shown in the accompanying photograph. It consists essentially of two compressors, one handling air, the other helium. The air compressor supplies air at high pressure to an expansion column, which serves to liquefy a portion of the air, forming a cooling bath at a temperature of 170 degrees C. The second compressor forces helium at high pressure through copper coils immersed in this liquid air, with consequent removal of impurities by liquefaction. The helium passes through nearly a half-mile of copper tubing, and is finally discharged at a purity of 98 per cent to any desired point and at any pressure up to 2,000 pounds per square inch. The loss in repurification is approximately 1 per cent.

Consumption and Stocks in the U. S.

(*Continued from page 656*)

facturers or dealers, but since a check-up with certain leading manufacturers and dealers showed that such bank stocks were being reported by these firms, it appeared that proper accounting practice of those in the trade would result in their reporting such stocks to us. It is, however, possible that some stocks of rubber might be held by banks which were not thus reported. It is not possible to estimate the amount of any such stock.

It is necessary to make some allowance for stocks held by manufacturers whose consumption was estimated, and who were active throughout 1929. The tonnage of rubber estimated to have been used by such firms during 1929 was about 6,000 tons, and an allowance of 1,000 tons would appear ample.

Minimum Year-End Stocks, 1929

	Long Tons
Manufacturers—	
Reported	67,127
Estimated	1,200
TOTAL	68,327
Dealers, Commission Agents, etc.	50,282
GRAND TOTAL	118,609

The above total is less than that shown in the table on calculated stocks, for the same date, by 3,453 long tons, and the existence of other stocks sufficient to balance or exceed the calculated December 31 stocks is not impossible.

EDITORIAL COMMENT

A Comparison of Forecasts

WITH the year well advanced and with practically all the prophets heard from, the time seems opportune to list the various prognostications bearing on the estimated production and consumption of crude rubber for 1930. It is still early to attempt any checking of these figures with actual performance but a comparison of the estimates supplies food for thought. The forecasts in long tons from several authorities, to which is added that of THE RUBBER AGE, are given below.

		Consumption		
	Production	U. S.	Other	Total
Symington and Sinclair	846,000	...	...	856,000
Hymans Kraay	838,000	...	...	830,000
Geo. White & Co.	843,000	460,000	355,000	815,000
Lane Mitchell & Co.	800,000	...	...	840,000
Figgis & Co.	846,000	450,000	380,000	830,000
Lloyd, Matheson	845,000	470,000	365,000	835,000
Rickinson & Son	834,000	515,000	360,000	875,000
Chas. Hope & Co.	855,000	432,000	418,000	850,000
Lewis & Peat	850,000	470,000	357,000	827,000
Harriss & Vose	800,000	...	...	859,000
Eric Miller	835,000	470,000	355,000	825,000
Dutch Producers Committee	820,000	...	...	850,000
Faulkner & Winsor	850,000	...	...	850,000
India Rubber World	838,000	508,000	336,000	844,000
E. A. Barbour & Co.	875,000	...	...	765,000
Rubber Age (London)	840,000	...	...	830,000
RUBBER AGE (N. Y.)	**910,000**	**490,000**	**340,000**	**830,000**
Average Estimate	842,650			836,000

The surprising thing about this year's prophesies is the narrow margin of variance between the different figures. Harriss & Vose seem to be the most conservative in predicting production while Barbour & Company are the bears from the consumption angle. While our own estimate for production tops all others, our estimated consumption figures can well be considered conservative in comparison with Rickinson and Son.

THE RUBBER AGE is not yet prepared to revise its figures either as to production or consumption. While it is true that the returns from producing areas have not shown any gains over the output of January 1929, it is far too early and the available statistics are too meager to assume that there will not be the normal increase in production which has occurred yearly since the first developments of rubber were begun in the Middle East. Nor does it believe that the present low price scale will have a deterrent effect on production from native areas, despite authoritative opinion to the contrary, and as for the proposed holiday from tapping during May, it has little confidence in the efficacy of such a scheme.

The Industry's Balance Sheet

WITH the annual financial statements of the larger rubber manufacturing companies for 1929 now available, it is possible to make some appraisal of the financial condition of the industry as a whole. Elsewhere in this issue of THE RUBBER AGE is given a story of the balance sheets of more important companies in the industry. It only remains to comment on the results therein shown. Although in total net profits the industry did well in comparison to 1928, the most cursory analysis of the figures would indicate that it is far from being in a hale and hearty condition. Prosperity appeared around the corner early in 1929 but grew very ill at ease as the year proceeded and made a sudden and very disconcerting exit in October, leaving the industry in a very nervous and feverish condition, which old Doctor Optimism and White House Conferences have not been able to wholly remove even at this date. The condition may, however, be largely the fault of the patient and the indirect consequence of "carrying-on without rhyme or reason," as one of the diagnosticians of the industry has put it.

At all events the consolidated reports of the "Big Five" companies show a mere 3 per cent profit of a business involving $811,000,000 in gross sales. This figure is after all charges have been deducted but before preferred dividends have been met. True, the net profits of slightly over $24,000,000 represented a gain of $22,000,000 over 1928, but 1928 was an exceptionally bad year, and the industry has netted much more than this figure in several previous years without doing nearly the volume of unit sales.

With these "Big Five" doing 70 per cent of the business of the entire industry, it is fair to consider their consolidated statement as representative of the industry as a whole. Goodyear came out best but only earned 7.8 per cent. Firestone and Goodrich followed in the order named. United States Rubber and Fisk, though bettering their 1928 position, made no profits. A sorry condition for one of the leading industries of the nation.

The RUBBER AGE *Published on the 10th and 25th of each month. The Only Twice-a-Month Rubber Publication.*

THE PALMERTON PUBLISHING CO., INC.

Editorial Office, 250 West 57th St., New York City

Telephones: Columbus 2923, 2924

THE RUBBER AGE is published on the 10th and 25th of each month by The Palmerton Publishing Co., Inc., a New York corporation. P. L. Palmerton, President; Earl D. Osborn, Vice-President and Secretary; Peter P. Pinto, Treasurer. Publication Office, 1-3 Peace St., New Brunswick, N. J. Subscription rates: Domestic, $2.00 a year; Canada, $2.50; foreign, $3.00; single copies, up to 3 months old, 20c; over 3 months old, 50c. Advertising rates on application.

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Representatives in all the rubber centers of the United States, Canada, England, France, Germany and the Middle East.

The Rubber Industry's CURRENT NEWS

Financial—Personals—New Rubber Products—
Building Operations—Manufacturing—Exports

DR. H. A. WINKELMANN WITH PALMER GAS CORPORATION

Dr. H. A. Winkelmann, chief chemist of the Philadelphia Rubber Works Company, has resigned to accept a similar position with the Palmer Gas Products Corporation, Shreveport, La., whose principal sales office is located in Akron, in charge of John W. Herron, vice-president. The Palmer Corporation, a pioneer in natural gas development in the southwest, last year joined the Electric Bond & Share interests in forming the Louisiana Gas & Fuel Co., the largest owner and distributor of gas in Louisiana.

N. C. McGowen, who formerly managed the Palmer interests in Louisiana, heads this

H. A. WINKELMANN

new combination which is now taking over the United Gas Company system throughout Louisiana and Texas. The Palmer Gas Products Corporation, with whom Dr. Winklemann has become associated, continues under the management of Mr. McGowen and includes all carbon black manufacturing units of the Palmer Carbon Co., North American Carbon Co., Louisiana Gas & Fuel Co., and the Panhandle Carbon Co., situated in Louisiana and Texas.

Dr. Winkelmann will take complete charge of development work in connection with rubber compounding laboratories now being established at the plants of the company.

Dr. Winkelmann, a graduate of the University of Illinois, held the rank of captain in the United States Chemical Warfare Service from 1917 to 1919, at which time he joined the B. F. Goodrich Company. There he successively occupied the positions of research chemist, research compounder, mecanical goods compounder, and technical superintendent of the tire division. In 1926 Dr. Winkelmann became chief chemist of the Philadelphia Rubber Works Company where he has since been in charge of research, development, and technical sales.

Norwalk Increases Output

March production of the plant of the Norwalk Tire & Rubber Company, Norwalk, Conn., has been running at double the rate of the February output and April will add 50 per cent to the March run, according to John W. Whitehead, president. Mr. Whitehead said several new accounts of considerable size have recently been added in the middle west.

Boston Woven Hose Contract

Preference was given to the Boston Woven Hose & Rubber Company by Mayor Curley of Boston in the award of a contract for fire hose amounting to $17,000. The bid of another company was $500 lower, but the mayor decided that local considerations were of sufficient importance to disregard the lowest bid.

Sulfur Tax is Rejected

The Texas State Senate has refused by a vote of 18 to 8 to adopt a resolution to instruct a committee to support a compromise tax of 75 cents a ton of sulfur. The senators have stood firmly against a levy of more than 50 cents, while the State House of Representatives is solidly supporting a $1 tax. Representative Phil Sanders, author of the $1 tax measure, estimates that it would produce between $2,000,000 and $4,000,000 annually to the state.

MERRIMAC CHEMICAL FIRE FAILS TO HALT OUTPUT

A fire that swept through the Everett, Mass., plant of the Merrimac Chemical Company, a division of the Monsanto Chemical Works, on March 15 was reported by Edgar M. Queeny, president of Mansanto, as involving no loss to the company. The damage was fully covered by insurance, and no suspension of service to customers or serious impairment to business resulted. Early newspaper reports placed the damage as high as $500,000, but it is not believed to have been so high inasmuch as steam was raised in the boilers within 24 hours after the fire and the situation appeared well in hand.

Duplication of plant facilities makes it possible for Monsanto to meet the situation with the minimum of disturbance to its usual business routine. The Merrimac company, which was acquired by Monsanto last year, has, in addition to the plant at Everett, large works in the near-by town of Woburn, Mass.

F. H. AMON NAMED HEAD OF CABOT LABORATORIES

Fred H. Amon, formerly of the B. F. Goodrich Company, has recently joined Godfrey L. Cabot, Inc., as technical director of its research and service laboratories in Boston.

Mr. Amon had been in the laboratories of the B. F. Goodrich Company for twelve years, from 1917 to the end of 1929, first as works chemist; then as research chemist;

F. H. AMON

later in mechanical goods compounding division; following that, for four years in the raw materials division; then as manager of the technical service for the milling and calendering division; finally, before leaving the B. F. Goodrich Company, in the tire compounding department.

During those years he had more than the usual amount of contact with problems involving the use of carbon black in all varieties of rubber stocks. This unusually wide and varied training particularly qualifies him for his new position.

Born in Greenville, Pa., in 1893, he graduated as a Master in Science from Allegheny College in 1917 and went directly from college to the Goodrich laboratories. Mr. Amon is a member of the American Chemical Society, the Franklin Club of Akron and the professional chemical fraternity, Alpha Chi Sigma.

GEORGE MILLER, constructural engineer of the Firestone Tire & Rubber Company, recounted his experiences during two years on the Firestone plantations in Liberia at a meeting of the Community Association of Minerva, O., on March 3.

UNITED CARBON COMPANY NETS $1,314,555 IN 1929

The United Carbon Company has declared a dividend of 50 cents on its common stock, payable April 1 to stock of record March 15. Dividends on this stock were initiated with the payment of 50 cents on January 1 of this year. At the annual meeting, Colonel Grayson M.-P. Murphy, a director of the Goodyear Tire & Rubber Company, was elected a director, replacing C. F. Clay, who resigned, and other directors of the company were reelected.

The United Carbon Company has reported a net profit in 1929 of $1,314,555 after depreciation, depletion, interest, federal taxes and other deductions. Net sales amounted to $4,321,732, according to the consolidated income account. The company has exchanged 397,885 shares of its no-par common stock for the voting trust certificates previously issued under a five-year trust agreement which expired on March 1.

The company's carbon black production last year amounted to 94,213,894 pounds, compared with 60,525,530 pounds in 1928 and with 33,684,525 pounds during 1927. Of the 1929 output, the largest quantity, 60,524,301 pounds, was produced at the company's Texas plants.

The company's Louisiana production, on the other hand, dropped from 35,435,892 pounds in 1928 to 31,354,768 pounds in 1929. The company's carbon black production in Kentucky, which declined from 3,510,778 pounds during 1927 to less than 500,000 pounds during 1928, was suspended altogether last year.

Explaining the shift in carbon black operations, President Oscar Nelson said that the company's policy is to move plants from states where a good market has been developed for its supply of natural gas to the states where substantial amounts of gas at low prices are available for the manufacture of carbon black.

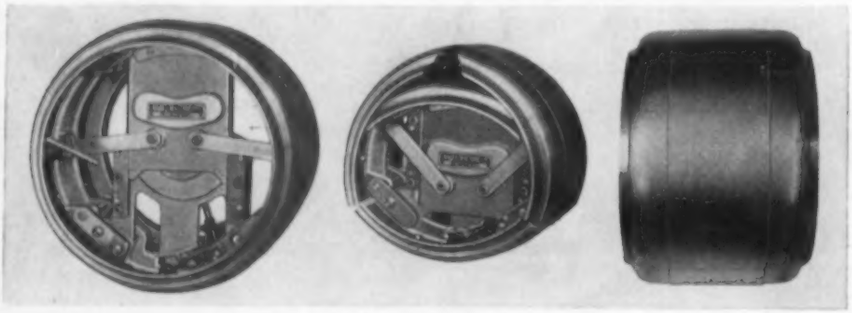
New Schrader Head

William T. Hunter, who was elected president and general manager of A. Schrader's Son, Inc., Brooklyn, N. Y., makers of tire pressure gauges and tire valves, and a director of the Scovill Manufacturing Company, Waterbury, Conn., last month. Mr. Hunter was formerly vice-president and general manager of the Schrader company, which was recently acquired by the Scovill organization.

Protest Pioneer Power Contract

The village of Willard, O., may enjoin the Pioneer Rubber Company from purchasing electric current from the Ohio River Power Company instead of from the village. This action was suggested after a discussion by the village council of the rights of the rubber company to enter into a contract with the power company. The company contends that it can buy current more cheaply from the power firm than from the village.

Powerfold Tire Building Drum



UNDER the name of the Powerfold drum, the Nagle Machine Company, Erie, Pa., is offering a new power-operated flat-band tire building drum. The drum, which is illustrated above in full circular, collapsed and side positions, is folded by the motor power acting through a combination of cam groove and crank action. A reduction of 25 per cent in periphery may be obtained, according to the manufacturer.

To fold the drum it is merely held stationary, one-half revolution of the main drive shaft in either direction causing the drum to fold. The drum automatically unfolds, or returns to full circle, as soon as the tire machine is started, this operation requiring no attention other than the starting of the machine. Neither operation produces any shock, due to the crank action. The flanges are mechanically adjusted for width by double acting screws, which are operated by a pinion wrench. Thus the center line of the flanges is fixed.

PHOENIX COMPANY NAMES NEW OFFICERS FOR 1930

At the annual meeting of the board of directors of the Phoenix Manufacturing Company, Joilet, Ill., manufacturer of horse shoes and Powers rubber shoes and pads, held on March 4, John W. Kiser, who was president, was named chairman of the board. Edward N. Gosselin, former vice-president, was elected president, while M. F. O'Connor, eastern sales and export manager, was made a vice-president.

The company has three plants at Joilet, Ill., Catasauqua, Pa., and Montreal, Que., and sales offices in Chicago, New York and Montreal.

General Votes Dividend

Directors of the General Tire & Rubber Company have declared the 50th consecutive dividend on the company's preferred stock, payable March 31 to stockholders of record as of March 20. This dividend of 1¾ per cent, or $1.50, will be paid on the 33,601 shares of 6 per cent preferred stock outstanding. It is reported that tire and tube sales to dealers last month were higher than sales either in February, 1929, or in January of this year.

Monsanto Earnings Higher

The Monsanto Chemical Works, including the Rubber Service Laboratories Company and other subsidiaries acquired during the year, reports a consolidated net profit for 1929 of $1,691,338 after depreciation, interest and federal taxes, equal to $4.25 a share on 398,286 shares of no-par stock outstanding at the end of the year. The net profit of the parent company for 1929 was $1,087,571 after charges and taxes, equal to $2.73 a share on 398,286 shares of stock, comparing with $944,438 or $7.51 a share on 125,604 shares in 1928.

Rubber Stocks Go Higher

Most rubber company stocks showed gains during the fortnight, although General common and Seiberling preferred made new lows. The market is now awaiting the action to be taken at the Goodyear annual meeting of March 31. Prices of leading rubber company shares on March 19 compare as follows:

	Last Price		High	Low
	Mar. 19	Mar. 5	—1930—	
Ajax	2⅛	2	2½	1⅞
Falls	—	—	4¾	3
Faultless	—	—	37	34⅝
Firestone	27½	28	33⅛	26
do. 6% pfd.	85	81⅝	86⅝	79¾
Fisk	3⅝	3⅝	4¼	3
do. 1st pfd.	16	16½	20	13
General	—	140	160	135½
do. pfd.	—	—	91	88½
Goodrich	48¾	48½	51⅜	40¼
do. pfd.	103	—	103½	95⅝
Goodyear	91⅛	84½	92⅝	62
do. 1st pfd.	100	99	100⅞	90
India	—	—	18	8½
Intercontinental	—	5⅜	6⅜	4¼
Kelly Springfield	4⅞	4¾	5¾	3¼
do. 6% pfd.	—	—	39	29
Lee	8⅞	—	9	6¼
Miller	4½	4¼	4⅝	3⅞
do. pfd.	34½	—	34½	18
Mohawk	10½	10½	14	8½
do. pfd.	—	—	55	50
Norwalk	1½	—	1½	⅞
Pirelli	—	48½	50¼	45
Raybestos-Manhattan	39	38	43¼	33
Seiberling	12½	16	18½	10¼
do. pfd.	52	—	78	50
U. S. Rubber	28⅝	27⅝	29½	21¼
do. pfd.	55	54	55	47¾

NEW YORK RUBBER GROUP WILL MEET MARCH 28TH

Members of the New York Group of the Rubber Division of the American Chemical Society will hold their next meeting on March 28 at the Town Hall Club, 123 West 43rd Street, New York City. A dinner at 6 P. M. will precede three papers and musical and other entertainment.

S. Y. Austin, vice-president of the Callaway Mills, will speak on "Fabrics Used in the Rubber Industry from the Mill Man's Viewpoint," and B. H. Foster, textile section, United States Rubber Company, will read a paper on the topic "Getting Better Acquainted with the Stretch Properties of Cotton." E. G. Holt, chief of the Rubber Division of the United States Department of Commerce, will talk on the subject of "Rubber Statistics."

Reservations for this dinner meeting should be made imediately with K. J. Soule, secretary-treasurer of the group, at the Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., Passaic, N. J.

DISCUSS RUBBER IN CARS AT A. S. T. M. MEETING

A discussion of automotive materials was featured at a regional meeting of the American Society for Testing Materials at the Book-Cadillac Hotel, Detroit, Mich., on March 19. The morning session was entirely devoted to metals, but in the afternoon conference Walter C. Keys, chief engineer of the automotive development department of the United States Rubber Company, spoke on "Advances in Rubber for Automotive Use."

Although rubber has been used for automobile tires from the beginning, Mr. Keys pointed out that the automotive industry has only recently really "discovered" rubber as a structural material. In his paper, he enumerated 65 specific uses to which rubber is now being applied in motor vehicles, including parts for absorbing and dampening vibration, for deadening noise, for eliminating metallic joints or protecting them, for electrical insulation, for protecting parts against wear, and the like.

"Vulcanized rubber is unique among materials of construction," Mr. Keys declared. "It resembles a liquid in that it is almost non-compressible. It resembles a gas in that work done on it is converted partly into heat.

"Rubber is now being vulcanized to other materials, such as metals and wood, and rubber latex is being used for impregnating porous materials, such as paper. An insulation rubber that will not tarnish silver, and a pile carpet made by attaching the fibers to the backing fabric with rubber are interesting new developments in the application of rubber to the motor car.

"Much is still being learned about the physical properties of rubber. Rapid advances are accordingly being made in the application of rubber to new services, and it is to be expected that the usefulness of rubber to the motor car will still continue to be largely extended."

L. C. ROCKHILL

R. T. GRIFFITHS

Personnel Changes Are Made In Miller Rubber Company, Inc.

R. T. GRIFFITHS, formerly vice-president of the Miller Rubber Company in charge of production, has been made vice-president and general manager of the Miller Rubber Company, Inc., following the recent purchase of Miller assets by the B. F. Goodrich Company. This announcement, with other personnel changes, was made by T. G. Graham, first vice-president of the B. F. Goodrich Company. Mr. Griffiths will have charge of manufacturing and sales of all Miller products except tires, accessories, mechanical rubber goods and footwear. Miller products will be sold by the Miller Rubber Products Co.

G. E. BRUNNER

Mr. Graham also announced that G. E. Brunner has been made sales manager of the Miller Tire division. He will be assisted in this department by E. P. Weckesser, manager, automobile tire sales; A. L. Bowman, manager, truck tire sales; J. W. Hodgson, manager, accessories, repair materials and special brand products; W. J. Frisby, manager, operating division; H. B. Sherbondy, stock distribution division; Guy Blanchard, advertising manager.

The Pacific Coast division will be supervised from the Pacific Goodrich offices in Los Angeles. L. L. Flack wil have charge of the Miller eastern division; E. Farr will be in charge of the western division and Mr. Brunner will supervise the southern division as heretofore.

L. C. Rockhill, formerly vice-president of the Miller Rubber Company, in charge of Sales, has joined the Goodrich organization in the capacity of merchandising counsel, Mr. Graham announced. W. C. Behoteguy of Mr. Rockhill's former sales executive personnel, has also joined Goodrich in the sales division. G. S. Earseman will join the Goodrich organization in sales personnel work as soon as he has completed similar duties in the new Miller organization. F. W. Lohmann, who was assistant to Mr. Rockhill in the old Miller organization, has resigned and will return to the Goodyear Tire & Rubber Company on April 1, where he will be attached to the division offices. Mr. Lohmann was with Goodyear for 14 years in operating and sales departments before going to Miller when Mr. Rockhill left Goodvear to become Miller sales manager in January, 1928.

In announcing this lineup in executive personnel, Mr. Graham said that the Goodrich management will expand the operation of the Miller plant and that Miller tires will continue in production there exactly in accordance with present specifications.

Other officers of the Miller Rubber Company, Inc., and the Miller Rubber Products Company, Inc., are J. D. Tew, president; T. G. Graham, vice-president; V. I. Montenyohl, treasurer; and S. M. Jett, secretary, all of whom hold similar offices with the B. F. Goodrich Company.

Names in the News

DR. WILLIS A. GIBBONS, director of the development department of the United States Rubber Company, gave a talk on "Recent Scientific Advances in the Rubber Industry" at a meeting of the South Jersey Section of American Chemical Society at the Du Pont Club, Carney's Point, N. J. On February 24, he spoke before the Illinois Manufacturers' Costs Association at the Hotel La Salle, Chicago, Ill., on "Scientific Research as a Function of Business."

SAMUEL WOOLNER, JR., president of the Kelly-Springfield Tire Company, Cumberland, Md., spoke on the uses of rubber on a special radio program broadcast under the auspices of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., on March 11.

D. W. WARDEN, vice-president of the Dayton Rubber Manufacturing Company, visited Los Angeles, Cal., during the early part of the month as a guest of FRANK T. PRICE, president of Nelson & Price, Inc., Dayton tire distributors.

WILLIAM T. MALONE, JR., president of the General Supply & Chemical Company, Trenton, N. J., gave a talk on the subject of "Rubber Reclaiming" before the members of the Trenton Rotary Club last month. He declared that the reclaiming of rubber is one of the most important divisions of the rubber industry.

EDWARD J. SWEENEY, of Trenton, N. J., has been appointed general manager of the Walton Tire Service, Inc., Philadelphia, Pa. Mr. Sweeney was formerly territory salesman for the Firestone Tire & Rubber Company with headquarters in Philadelphia.

WILLIAM H. SAYEN, president of the Mercer Rubber Company, Trenton, N. J., who acted as foreman of the Mercer County grand jury, was presented with a handsome traveling bag by the other members of the jury last month. The presentation took place at a banquet in his honor.

ROBERT J. STOKES, president of the Thermoid Rubber Company, Trenton, N. J., has been spending the past few weeks in Havana, Cuba.

CATALPO
for
Cushion Stocks

A. M. LEACH APPOINTED U. S. RALEIGH MANAGER

The United States Rubber Company has announced the opening of a new district sales office in Raleigh, N. C. This district office will control local branches in Charlotte, Greensboro, Wilson, Asheville, Greenville, and Columbia. It will be headquarters for the full line of United States tires, including the latest improvements in heavy service equipment.

A native of Raleigh, Allan M. Leach, has been appointed district manager in charge

ALLAN M. LEACH

of the Raleigh office of the United States Rubber Company. Mr. Leach has been employed by this company for the past ten years. Recently he was a special representative of the motor coach and cab division with headquarters in Detroit, Mich. Six years previously he was manager of the local branch in Raleigh. He is well known in the Carolinas.

V. R. JACOBS, assistant manager of the aeronautics department of the Goodyear Tire & Rubber Company, addressed the combined service organization of Kansas City on March 11 as a part of his western speaking tour. On March 14 he addressed the Southern California Section of the Society of Automotive Engineers, the Southern California Chapter of the National Aeronautic Association, the Professional Pilots' Association and the Air Post of the American Legion at Los Angeles. During the following week he spoke in San Francisco before the Chamber of Commerce, Commercial Club, Downtown Association and National Aeronautic Association.

NATHAN CURTIS, whose business association with the Mechanical Rubber Company has compelled him to move to New York City, has resigned as treasurer of the village of Garfield Heights, O.

R. C. GRAFMILLER has retired from the board of trustees of the Goodyear Hospital Association. He was the first president of the association and was identified with the body from the time it was first proposed in the Industrial Assembly of the Goodyear Tire & Rubber Company employes.

T. G. GRAHAM, first vice-president of the B. F. Goodrich Company, has been appointed a member of the Civil Service Commission at Kent, O. Mr. Graham was the Republican candidate for mayor of Kent in 1923 and has always been active in the civic affairs of that town where he maintains his residence. Prior to his connection with Goodrich, he was superintendent of the Mason Tire & Rubber Company at Kent.

F. O. WASHAM of the Goodyear Tire & Rubber Company addressed a meeting of the Cincinnati Restaurant Association at that city on February 25.

PHILLIP UPHAM has been appointed head of the advertising department of the Firestone Footwear Company, succeeding G. G. KING.

DR. LUDWIG DUERR, designer and builder of the Graf Zeppelin, visited Akron during late February and early March to confer with Dr. Karl Arnstein, vice-president of the Goodyear-Zeppelin Corporation, and other members of the staff supervising the construction of the two new Navy dirigibles.

F. W. WARD, vice-president, SIDNEY J. TENNANT, secretary, and HECTOR J. LUCIER, treasurer and general manager of the Bay City Rubber Company, have returned to Bay City, Mich., after a meeting of the board of directors of that company in New York City.

HERBERT H. SPRINGFORD, formerly executive assistant to the president of the Goodyear Tire & Rubber Company, has been elected chairman of the board of directors of Servel, Inc., manufacturers of mechanical refrigerators. Mr. Springford was also formerly vice-president of Dodge Brothers, Inc., and president of the Steel and Tube Company of America.

CARLE C. CONWAY, a director of the United States Rubber Company, has been elected chairman of the board of directors of the Continental Can Company. He was formerly president of that organization.

P. W. LITCHFIELD, president of the Goodyear Tire & Rubber Company, returned from his annual inspection tour of the Goodyear tire and tire fabric plants at Los Angeles, Cal., and the Goodyear cotton plantations at Litchfield, Ariz., to attend the 20th anniversary dinner of the Boy Scouts of America at Washington, D. C., on March 10.

Rubber Goods and Specialties

Machine-Made Truck Tire

The Michelin Tire Company, Milltown, N. J., has added to its line what are said to be the first large-sized truck tires built by machine in the same manner as passenger car casings. Every ply of these new truck tires is laid on with the same uniform tension by new special machines developed by

the manufacturer, and the result is claimed to be a uniformity of construction previously impossible. The casing has an extra strong, yet flexible, carcass and a thick, heavy tread, combining long wear and non-skid protection. The sidewalls are heavily reinforced against rut and curb chafing.

"Major Bubbles" Balloon

"Major Bubbles" is a novel new toy rubber balloon just introduced by the Oak Rubber Company, Ravenna, O. The "Major" is made of a large airship which forms the body and head and two smaller airships which form the arms. The arms are fas-

tened in a manner which permits them to swing with the breeze when the "Major" is set up on display. This produces a colorful motion that attracts attention and is, therefore, an aid to sales. The new balloon stands 20 inches high, and the complete outfit, which is easily assembled, is sold in an individual box.

Bishop Contact Cable

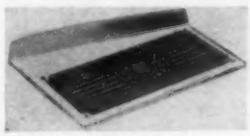
The Bishop Wire & Cable Corporation, 420 Lexington Avenue, New York City, has developed for special uses an electric cable, pressure on any part of which will close the circuit. This feature results from the unique construction of this cable. Two conductors, inclosed by the outside insulation, are left bare but separated from each other by an "isolation cushion." When the cable is pressed at any point, this "isolation cushion" of rubber yields and permits the outer conductor to contact with a wire which is always in contact with the inner conductor, thus closing the circuit. Bishop contact cable is particularly adapted for remote machine control, for automatic traffic control and for signal systems in mines, hospitals, banks, etc.

Foot-Arch Supports

A spring insertion for boots and shoes adapted to support the arch of the foot, recently patented by J. May, Frankfort-on-Main, Germany, consists of two or more springs of different lengths connected together at the center. In an example three springs are shown, the springs being of similar shape and of respectively increasing curvature, and being connected together at the center by a screw and nut by riveting, or by spot welding. An elastic pad is provided over the nut, etc., to limit the flattening of the springs, and additional non-slip pads may be provided. Thin layers of rubber may be placed between the springs at their point of connection. The springs may be provided with a leather covering sole or may be fitted into a leather case, and thin rubber may be placed between the springs and the leather. The springs may be connected so as to allow of relative movement, and the insertion may be placed between the inner and outer soles of a shoe.

Dunlop Step Plate

Among several new features in the range of automobile accessories of the Dunlop Rubber Company, Ltd., Fort Dunlop, Birmingham, England, are running board mats for certain makes of cars. The step mat for the Morris Minor, illustrated herewith, is of attractive design and well made. It is sold by the manufacturer to retail at 14s. 6d. per

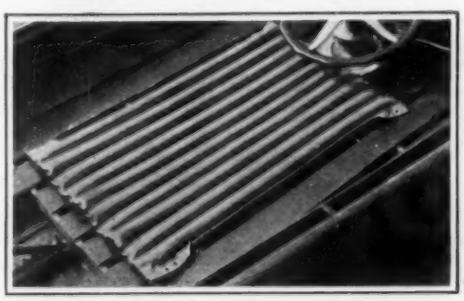


pair. Dunlop is also making an endless V-type belt for the same make of car, an item only recently added to its line. Other new features in the Dunlop accessory line are rubber-headed mallets for straightening dented fenders and compact tire repair outfits which include a roll of patching rubber, a large tube of rubber solution, a pair of scissors and a metal scraper.

Resilient Tire

A cushion tire in which a rubber body is molded with air pockets of elongated form with their length extending obliquely to the circumference of the tire, forming webs, the inner ends being closed by wire reinforced band, has been patented by C. G. Worsley, Victoria, Australia. A self-closing valve protrudes into passages in communication with the cells which are connected by vents. The body may be molded with a tread or enclosed in an ordinary cover. In a modification, an inflatable tube is positioned in a channel formed in the body.

Airubber Speed Boat Pad



The New York Rubber Corporation, Beacon, N. Y., has added to its line a new multiple air-chamber Airubber speed boat pad designated as No. 511. This pad is light, shallow yet soft, and keeps the center of gravity low. Strongly made, it stands abundant pressure. It absorbs jump shock and never watersoaks, according to the manufacturer. Brass grommets are included for tying in the boat, and, if the boat swamps or upsets, this inflated pad will help to keep it afloat. The size of this No. 511 pad is 20 by 36 inches and its weight 3¼ pounds. Other Airubber boat pads are also made with thicker air chambers at various prices.

Current Crude Rubber Items

U. S. PLANTATIONS EARN $666,044 DURING 1929

Net earnings of the United States Rubber Plantations, Inc., for the year ended December 31, 1929, amounted to $666,044 after ample reserves for amortization of the cost of development, depreciation of plant and equipment, and foreign income taxes. These profits are not included in the earnings statement of the United States Rubber Company, shown elsewhere in this issue.

The total area of the plantations, which are located in Sumatra and Malaya, is 135,160 acres. About 92,600 acres have been planted and over 64,000 acres are in bearing, including 5,000 acres that became mature during 1929. Production for the year amounted to 32,971,000 pounds, or 14,719 long tons, as compared with 28,767,000 pounds in 1928.

The largest plantations unit, consisting of more than 46,400 acres in tapping, now yields 570 pounds an acre per year, compared with 386 pounds an acre per year, which is approximately the average obtained by the rubber producing industry as a whole.

FORD BUYS FARM LANDS FOR EDISON EXPERIMENT

By purchasing the Vallambrosia plantation of nearly 5,000 acres, 14 miles west of Savannah, Ga., Henry Ford now has available 25,000 acres of Georgia farm land for use in aiding Thomas A. Edison's experiments in making rubber from golden rod. Mr. Edison, who is 83 years old, declared on March 17 that he expects to continue working an average of 14 hours a day until the problem is solved. "Give me five more years," he said, "and the United States will have a rubber crop which can be utilized in less than 12 months' time."

Work is now being carried on by draftsmen in the Edison laboratories to produce machinery to extract commercial rubber from golden rod. Mr. Edison stated that he and his associates have found a variety of the plant that grows 10 feet above a man's head and that by cross-breeding a plant may be developed carrying 8 per cent fine-grade rubber.

Rubber Exchange Votes to Add New Ten-Ton Unit of Trading

MEMBERS of the Rubber Exchange of New York voted on March 7 to adopt the 10-ton trading unit in the new No. 1 standard contract recently announced. Trading in the new rubber contract, which provides for fluctuations of one-hundredth of a cent per pound in price, will begin on April 1 for deliveries on and after May 1.

The new No. 1 standard contract is comparable to the form of contract used in the London rubber market. Commissions on the new contract are one-way commissions for buying and selling, and on a sliding scale based on varying prices for rubber. There is also a provision for commissions on complete straddle transactions under the No. 1 standard contract.

"The adoption of the 10-ton unit with one point fluctuations in the new No. 1 standard contract by the members of the exchange is a constructive move," said F. R. Henderson, president, "which should have strong appeal to the rubber industry here as well as to the foreign market.

Expected to Broaden Trading.

"The board of governors expects that the new contract with the changes made will materially broaden the market and make for more flexible operations. Manufacturers who use our trading facilities and take delivery of rubber will now have no cause to worry as to quality, as it will be certified by the exchange under the new contract."

Trading in the present "A" contract of 2½ tons will continue in multiples of ten one-hundredths of a cent, with the round turn commissions as heretofore. Thus the exchange is given two contracts, of which the No. 1 standard covers prime grades, while the "A" contract takes in grades slightly inferior to prime standard crude rubber, with suitable differentials provided. According to the provisions adopted by the exchange members, "In fulfillment of every No. 1 standard contract the seller must deliver 10 tons (22,400 pounds a variation in weight of not more than one per cent being permitted) of Rubber Exchange No. 1 standard quality ribbed smoked sheets Hevea plantation rubber conforming to the type adopted by the board of governors. The seller may deliver against said contract ribbed smoked sheets Hevea plantation rubber of a quality superior to the official type at the contract price."

Previously the members of the exchange voted to eliminate from trading the "BB" contract of sub-standard rubber, which has been inactive almost from its inception on September 1, 1928. The members also voted, 66 to 63, to eliminate all consideration for five-ton trading unit in the new No. 1 standard contract. Commission houses were understood to have favored the 10-ton unit, while others chiefly in the trade, supported the five-ton delivery with fluctuations of five one-hundredths of a cent.

May Eliminate Present Contract

The fact that the new contract assures the buyer who accepts delivery of rubber of getting the prime grade has caused many in the trade to believe that it will encourage trading, especially of the "cash and carry" variety. Under this form of trading, purchases of the current delivery month are made against sales of the far distant position at a premium. The buyers takes delivery and stores the rubber against his distant sales contract, the difference in warehouse and carrying charges on one hand and the premium of the future sale on the other representing the operator's profit.

Some factors in the trade were of the opinion that the volume on the present "A" contract would not be affected at first, but that the new contract will be gradually adopted as an instrumnt of rubber trading to the eventual exclusion of the present terms. These factors believe that the larger unit of trading will soon prove its practicability, as has been the case on the National Raw Silk Exchange.

Closing Prices on Rubber Exchange of New York, Inc.

FROM MARCH 6 TO MARCH 18, 1930

		Spot	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Sales*
Mar.	6	15.00	14.90	15.10	15.30	15.50	15.80	16.00	16.20	16.40	16.50	16.70	16.90	17.10	207
	7	15.30	15.10	15.30	15.60	15.80	16.10	16.30	16.50	16.70	16.80	17.00	17.20	17.40	264
	8	15.40	15.30	15.50	15.70	15.90	16.10	16.30	16.50	16.70	16.90	17.10	17.30	17.50	359
	10	15.40	15.10	15.30	15.60	15.80	16.10	16.30	16.50	16.70	16.90	17.10	17.30	17.50	155
	11	15.00	14.80	15.00	15.20	15.40	15.60	15.80	16.10	16.30	16.40	16.60	16.80	17.00	205
	12	15.00	14.80	15.00	15.20	15.40	15.70	15.90	16.20	16.40	16.50	16.60	16.80	17.00	91
	13	14.90	14.80	15.00	15.20	15.40	15.60	15.80	16.10	16.30	16.40	16.60	16.80	17.00	150
	14	14.90	14.80	14.90	15.20	15.40	15.60	15.80	16.00	16.20	16.30	16.50	16.70	16.90	134
	15	14.90	14.80	14.90	15.20	15.40	15.70	15.90	16.10	16.30	16.40	16.60	16.80	17.00	15
	17	15.10	15.10	15.30	15.50	15.70	16.00	16.20	16.40	16.60	16.70	16.80	17.00	17.20	120
	18	15.20	15.10	15.20	15.50	15.80	16.10	16.30	16.50	16.70	16.80	16.90	17.10	17.30	198

*In lots of 2½ tons each

CATALPO

for

Inner Tubes

Levi Addison Ault

Levi Addison Ault, founder of the firm of Ault & Wiborg, manufacturers of printing inks and dry colors, died at his home at Cincinnati, O., last month at the age of 78. Born in Ontario, Canada, on November 24, 1851, he entered the lamp black industry in Cincinnati and in 1891 formed a partnership with Frank W. Wiborg. At that time he was elected president of the firm, which position he held until June, 1928, when he disposed of his interest to the International Printing Ink Company.

Adolph Hirsch

Adolph Hirsch, president of Adolph Hirsch & Company, Inc., 63 Park Row, New York City, importers of rubber and other products, and founder and a director of the Diamond Drill Carbon Company, importer of diamonds, died on March 5 after a three months' illness at his residence, the Hotel Navarro, New York City. He was 69 years old.

Born in New Rochelle, N. Y., on July 18, 1860, Mr. Hirsch in 1877 entered the employ of Abe Stein & Company, importers, and a year later became the firm's head foreign buyer and representative, spending the next three years in Arabia, India and Egypt, where he established branch offices. He later represented his firm in Mexico, Russia, London and Brazil, and, while in South America, left the Stein company to form the firm of Hirsch & Hess for the buying of skins and hides and exporting them to the United States. This was in 1888, during which year he also founded the Diamond Drill Carbon Company, of which he was president for many years.

In 1903, Mr. Hirsch withdrew from Hirsch & Hess and, having returned to New York to reside, established with other members of his family the firm of Adolph Hirsch & Company, which now has affiliated companies throughout the world. He was a member of the Rubber Exchange of New York and of other commodity exchanges. For eight years while in business in Brazil, Mr. Hirsch was American consul at Bahia.

Cyanamid Drops "Retardox"

The American Cyanamid Company has abandoned the use of the trademark, "Retardox," on rubber chemicals, thus closing the trademark suit with the Rubber Service Laboratories Company, which uses "Resistox" on similar products.

CATALPO
for
Footwear

Goodyear Cotton Fields Also Produce Cattle and Oranges

The Goodyear Tire & Rubber Company grows part of its cotton for tires on its own 37,000-acre plantation in Arizona, but this tract is also used for the raising of other products that have no connection with the rubber industry. For here Goodyear raises cattle and sheep, grows oranges and grapefruit, runs a hotel, raises turkeys and chickens, even keeps bees.

There are different reasons for these varied activities. For example, cotton robs the land of its nitrogen, making it necessary to plant alfalfa on part of the ranch every year. Instead of selling the alfalfa, Goodyear buys up cattle from the open ranges, fattens them on the alfalfa, and sells them off in four or five months. They have some 2,000 cattle on the ranch now.

Service Records at Goodrich

Many employees of the B. F. Goodrich Company have unusually long service records, and the service of four men in the production department at Akron alone totals 142 years. Ed Wilhelm, calender expert, is the oldest active employee with a record of 42 years of continuous service. Fred Meier, known as "the guardian of quality in rubber stock," is next with 38 years. Arthur Capron, who recently returned from Japan, ranks third with 32 years and John Noonan, production superintendent, is fourth with 31 years.

Government Specifications

The Federal Specifications Board is resubmitting to representative manufacturers proposed specifications for rubber-metal gasoline hose. The board will send copies of the proposals to any firm interested and will be glad to receive any comment or suggestions as to changes which may be thought desirable. These comments should be sent to reach the board by April 10 to receive attention from the technical committee considering the subject.

Consulting Rubber Technologist
PRACTICAL
Twenty years' experience with the largest and most successful companies in the country
Physical and Chemical Testing
Special facilities for abrasion and quick age tests
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New Processes and Formulas Developed
R. R. Olin Laboratories
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Telephones: Barberton 828, Portage 5895W

Girl Wins Goodyear Award

Katherine Grimes, of final inspection, Dept. 156E, Goodyear Tire & Rubber Company, has set a new record for suggestion awards paid to Goodyear women employes by winning a prize of $225 in the first March suggestion award list. Previously none of the Goodyear girl workers has received a suggestion award larger than $25. The company in this first March list paid a total of $1,342 to 60 employes, setting a new high mark for the present year.

Form Chicago Jobbing House

A newcomer in the general merchandising field is Associated Industries, Inc., of Chicago, Ill., a wholesale jobbing house, which will distribute a wide range of merchandise, including house furnishings, electric appliances, tires and automobile fabrics. The general offices, warehouse and salesrooms are located at 1222 South Michigan Avenue, Chicago, Ill.

CLASSIFIED ADVERTISING

Five cents a word, minimum charge $2.00, payable in advance.
Address replies to Box Numbers
THE RUBBER AGE
250 West 57th St., New York City

SITUATIONS WANTED

YOUNG MAN, ambitious, over ten years' practical experience, including executive, in all departments, chiefly mechanical rubber goods manufacture; capable of handling any position in above line; will consider any offer. A-1 references. Address Box 551, THE RUBBER AGE.

CHEMIST—College graduate with several years' experience in reclaimed rubber industry, desires permanent position as Chief Chemist or assistant with reliable rubber concern in New Jersey, preferably near Trenton, or Eastern Pennsylvania. Address Box 552, THE RUBBER AGE.

SUPERINTENDENT or General Foreman — Technical graduate with fifteen years' experience in the manufacture of tires and tubes, also soles and heels. Full knowledge of compounding, design and all manufacturing details; also competent in the handling of labor. References furnished on request. Address Box 549, THE RUBBER AGE.

HELP WANTED

PRACTICAL FOREMAN for a Rubber Room wanted by a large company in the New York district. Must be well experienced in rubber cement compounds, spreader work, etc. Write, giving age, experience and salary desired. Address Box 550, THE RUBBER AGE.

LATE MARKET PRICES

RUBBER—COTTONS AND FABRICS—CHEMICALS

NEW YORK, MARCH 19, 1930

RUBBER

Crude

ATTEMPTS during the fortnight to push the price of crude rubber upward met with unfailing resistance on the part of bearish operators, the result being that quotations closed on March 19 practically unchanged from their position two weeks ago. The low February consumption report for the domestic industry was far from bullish, while the high imports and marked rise in American and British stocks were distinctly bearish factors.

British plantation companies are hastening their support to the May tapping vacation proposal, but it is generally conceded that the utmost such a program can achieve is to hold back about 30,000 tons of rubber from the market. Inasmuch as world stocks are steadily reaching new high levels, this can not be considered a sufficient quantity to become an important factor in the price situation. The extent to which consumption will increase in the next few months will be a far more important factor in determining the course of the commodity.

Prices quoted on the New York outside market on March 19 were as follows:

Plantations—

Ribbed Smoked Sheets—			
Spot-Mar.	.14⅞	@	.15⅛
Apr.-June	.15	@	.15⅛
July-Sept.	.16	@	.16⅛
First Latex, crepe spot	.15⅜	@	.15⅝
Amber Crepe, No. 2	.13⅝	@	.14⅛
Amber Crepe, No. 3	.13⅝	@	.13⅞
Amber Crepe, No. 4	.13	@	.13⅜
Brown Crepe, Clean thin	.13⅝	@	.13⅞
Brown Crepe, specky	.13¼	@	.13½
Liquid Latex, per gal.	.90	@	

Paras—

Up-river Fine	.16½	@	—
Up-river Medium	Nominal		
Up-river Coarse	.08⅛	@	.08¾
Acre Bolivian, fine	.17	@	—
Caucho Ball, Upper	.08¼	@	.08½
Islands, fine	Nominal		

Centrals—

Central, scrap	.08¼	@	—
Esmeraldas	.08¼	@	—

Balata—

Block, Colombia	Nominal		
Block, Ciudad	.40	@	.41

LONDON MARKET

Standard Ribbed Smoked Sheets—Buyers			
Spot-Mar.		@	7⅝d
Apr.-June		@	7⅝d
July-Sept.		@	7⅝d

SINGAPORE MARKET

Standard Ribbed Smoked Sheets—Sellers			
Spot	7⅛	@	7¼d

Scrap

Dealers in scrap rubber are finding collections more difficult because of the low prices now prevailing. Demand from reclaiming mills is slowly increasing, however, and should be back to normal by the middle of spring. Latest price quotations for the various grades follow:

(Prices to Consumer)

Auto tire peelings	ton	32.50	@	34.00
Standard White auto	ton	40.00	@	45.00
Mixed auto	ton	20.00	@	21.00
Bicycle tires	ton	17.50	@	19.00
Clean solid truck tires	ton	24.50	@	25.00
Boots and shoes	cwt.	1.38	@	1.40
Arctics, untrimmed	lb.	.00⅞	@	.01
Inner tubes, No. 1	lb.	.07¼	@	.07½
Inner tubes, No. 2, compounded	lb.	.03¾	@	.03⅞
Inner Tubes, Red	lb.	.03⅞	@	.04
Air Brake Hose	ton	20.00	@	22.50
Rubber Hose	ton	17.50	@	20.00

Reclaimed

The consumption of reclaimed rubber dropped together with that of the crude commodity during the month of February. March absorption and production, however, are proceeding at a higher rate and the increase should continue through the spring months. The price scale has remained practically unchanged with the relative steadiness in crude rubber. Late quotations were as follows:

High Tensile

Super-Reclaim No. 1 Black	lb.	.11¾	@	.12
High Tensile Red	lb.	.10¾	@	.11

Shoe

Unwashed	lb.	.07	@	.07¼
Washed	lb.	.09	@	.09½

Tube

No. 1 (Floating)	lb.	.12	@	.12¼
No. 2 (Compounded)	lb.	.09	@	.09½

Tires

Black	lb.	.07	@	.07¼
Black, selected tires	lb.	.07¼	@	.07⅜
Dark Gray	lb.	.08¼	@	.08½
Light Gray	lb.	.09½	@	.10
White	lb.	.11	@	.11½
Truck, Heavy Gravity	lb.	.07	@	.07¼
Truck, Light Gravity	lb.	.07¼	@	.07½

Miscellaneous

Mechanical blends	lb.	.06	@	.06½
Red	lb.	.10½	@	.11

COTTON and FABRICS

Cotton

AFTER dropping to a new low point of 14 cents a pound on March 10, the spot price quotation for middling upland cotton has risen sharply a cent and a half. The true reason for the rise was no more apparent than the cause for the drop to the levels of early 1927, the only feature evident being that the speculative element is ruling the market.

That all bearish features have been fully discounted now seems to be generally admitted, although few will be so rash as to predict any sustained rise in the commodity. Mills have been making substantial commitments at the low prices, and the rubber factories have not been far behind in securing their requirements for their fabric plants.

The high, low and closing prices on the New York Cotton Exchange on March 19 were as follows:

	High	Low	Close	Close
		Mar. 19		Mar. 5
Mar.	15.51	15.31	15.31	14.52
May	15.64	15.32	15.44	14.75
July	15.73	15.38	15.48	15.00

Tire Fabrics

Prices of tire fabrics declined with the drop in raw cotton and rallied slightly as the commodity itself, closing the fortnight as follows:

CORD

Peeler, carded, 23/5/3	lb.	.42¼	@	.42½
Peeler, carded, 23/4/3	lb.	.44⅝	@	.45
Peeler, carded, 13/3/3	lb.	.38½	@	.39
Peeler, carded, 15/3/3	lb.	.39½	@	.40
Egyptian, carded, 23/5/3	lb.	.48¼	@	.48½
Egyptian, combed, 23/5/3	lb.	.53	@	.53½

CHAFERS

Carded, American, 8 oz.	lb.	.36½	@	.37
Carded, American, 10 oz.	lb.	.37½	@	.38
Carded, American, 12 oz.	lb.	.36	@	.37
Carded, American, 14 oz.	lb.	.35	@	.40

LENO BREAKER

Carded, American, 8¼ oz.	lb.	.37	@	.41
Carded, American, 10¼ oz.	lb.	.37	@	.41

SQUARE WOVEN

Carded, American, 17¼ oz. 23-11 ply	lb.	.42½	@	.43
Carded, American, 17¼ oz. 10-ply	lb.	.35	@	.35½

Sheetings

Latest closing prices for sheetings, which are fractionally lower, were quoted by the Textile Brokers Association as follows:

40-inch, 2.50-yard	yd.	.10¼	@	.10½
40-inch, 2.85-yard	yd.	.09	@	.09⅛
40-inch, 3.15-yard	yd.	—	@	.10
40-inch, 3.60-yard	yd.	—	@	.08½
40-inch, 3.75-yard	yd.	.07	@	.07½
40-inch, 4.25-yard	yd.	.06	@	.06⅛

Ducks

Cotton ducks have remained stable in price despite the continued fluctuation of the raw cotton market and the other fabrics. Latest price quotations follow:

Belting and Hose	lb.	.34½	@	.35
Enameling	lb.	.32	@	.32½
Single filling	lb.	.14½	@	.16
Double filling	lb.	.16	@	.17

CHEMICALS

PRICE quotations for chemicals and compounding materials used in the rubber industry showed little change during the course of the fortnight. Some of the oils showed a slight reduction, and such compounding ingredients as starch and whiting were a trifle easier, but otherwise the list remained unchanged. There was no rise in carbon black quotations, but business is becoming firmer as the season of demand from rubber factories commences and should soon be back to normal. The American Cyanamid Company, by adding the firm of Heller & Merz of Newark, N. J., to its list of acquisitions, took another step toward becoming a growing factor in colors. Four of its last six acquisitions were dye manufacturing companies.

ACCELERATORS

Organic				
A-1	lb.	.24	@	.27
A-5-10	lb.	.33	@	.36
A-7	lb.	.55	@	.59
A-11	lb.	.62	@	.66
A-16	lb.	.57	@	.61
A-19	lb.	.58	@	.62
A-20	lb.	.64	@	.68
A-32	lb.	.90	@	.95
Aldehyde ammonia, crystals	lb.	.65	@	.70
Aniline oil, drums, f.o.b. works	lb.	.15	@	.16
Captax	lb.	.60	@	.70
Crylene	lb.	.55	@	.65
paste	lb.	.45	@	.55
Di-Ortho-Tolyguanidine	lb.	.42	@	.44½
Diphenylguanidine	lb.	.30	@	.32½
Dipsol	lb.	4.30	@	4.50
Ethylidene aniline	lb.	.45	@	.47½
Formaldehyde aniline	lb.	.40	@	.42½
Heptene	lb.	.40	@	—
Hexamethylene-tetramine	lb.	.58½	@	.61
Lithex	lb.	.18	@	.20
Methylenedianiline	lb.	.37½	@	.40
Monex	lb.	3.25	@	—
Oxynone	lb.	.68	@	.80
Phenex	lb.	.75	@	—
R & H 40	lb.	.40	@	.42½
R & H 50	lb.	.40	@	.42½
R & H 397	lb.	.75	@	.77½
R-2	lb.	1.95	@	2.15
Safex	lb.	1.20	@	1.25
SPDX	lb.	.75	@	—
Super-Sulphur No. 1	lb.	.50	@	.52
No. 2	lb.	.18	@	.25
Tensilac, No. 39	lb.	.40	@	.42½
Tensilac, No. 41	lb.	.50	@	.52½
Thermlo F	lb.	.50	@	.55
Thiocarbanilid, drums	lb.	.25½	@	.28½
Trimene	lb.	.75	@	—
base	lb.	1.20	@	—
Triphenylguanidine	lb.	.58	@	.62½
Tuads	lb.	3.25	@	3.50
Ureka	lb.	.75	@	1.00
Vulcanex	lb.			
Vulcone	lb.			
Vulcanol	lb.			
Z 88	lb.	.50	@	.60
Zimate	lb.	4.00	@	5.00
Inorganic				
Lead, sublimed blue	lb.	.08¼	@	—
Lead, white	lb.	.08½	@	.08¾
Litharge, domestic	lb.	.09¼	@	.11
Magnesia, calcined, light	per 100 lb.	5.35	@	5.45
heavy	per 100 lb.	3.65	@	3.75

COLORS

Blacks (See Compounding Materials)

Blues				
Prussian	lb.	.35	@	.36
Ultramarine	lb.	.06	@	.32
Browns				
Sienna, Italian	lb.	.05¼	@	.12½
Umber, Turkey	lb.	.04½	@	.07
Greens				
Chrome, light	lb.	.30	@	.32
medium	lb.	.31	@	.33
dark	lb.	.34	@	.36
Chromium Oxide, bbl.	lb.	.34½	@	.35½
Reds				
Antimony crimson, 15/17	lb.	.40	@	.44
sulfur, free	lb.	.56	@	.66
golden 15/17 F.S.	lb.	.20	@	.25
Indian English	lb.	.08	@	.11
Domestic (Maroon)	lb.	.11	@	—
Oximony	lb.	.13¼	@	—
Red oxide, pure	lb.	.10	@	.12
Venetian red	lb.	.03	@	.06
Vermillion, quicksilver, English	lb.	2.00	@	2.05
Whites				
Lithopone, Akcolith	lb.	.05 3/5	@	.06
Lithopone, Albalith	lb.	.05¼	@	.05¾
Lithopone, Asolith	lb.	.05¼	@	.05¾
Lithopone, Vanolith	lb.	.05¾	@	—
Titanox B, f.o.b. St. Louis,	lb.	.07¼	@	.07¾
Titanox C, f.o.b. St. Louis,	lb.	.07¾	@	.08¼
Zinc Oxide—American Process				
American Azo:				
ZZZ (lead free)	lb.	.06½	@	.07
ZZ (leaded)	lb.	.06¾	@	.06½
Horsehead Brand:				
Special	lb.	.07	@	.07½
XX Green	lb.	.07	@	.07½
XX Red, lead free	lb.	.06½	@	.07
Kadox, black label	lb.	.10¾	@	.10¾
blue label	lb.	.09¾	@	.09¾
red label	lb.	.08	@	.08½
Zinc Oxide—French Process				
White seal	lb.	.11¾	@	.11¾
Green seal	lb.	.10¾	@	.10¾
Red seal	lb.	.09¾	@	.09¾
Yellows				
Chrome	lb.	.17	@	.17½
Ocher, French medium	lb.	.02	@	.03
domestic	lb.	.01½	@	.02

COMPOUNDING MATERIALS

Aluminum Flake	ton	21.85	@	24.50
Ammonia carbonate, lump	lb.	.07½	@	.07¾
Asbestine	ton	14.75	@	18.00
Barium carbonate	lb.	.03½	@	.05
Barium Dust	lb.	.05	@	.06
Barytes southern off-color	ton	12.00	@	18.00
Western prime white	ton	23.00	@	—
imported	ton	27.00	@	36.00
Basofor	lb.	.04½	@	—
Blacks				
Arrow "Aerfloted"	lb.	.06½	@	.12
Bone Black	lb.	.07	@	.08½
Carbon, compressed	lb.	.05	@	.10
Carbon, uncompressed	lb.	.05	@	.10
Disperso, f.o.b. Louisiana	lb.	.051	@	—
Disperso, f.o.b. Texas	lb.	.05	@	—
Drop Black	lb.	.06	@	.14
Fumonex	lb.	.04½	@	.08
Excello, compressed	lb.	.05½	@	.10
Gastex, f.o.b. Texas	lb.	.04¼	@	.05½
Lamp Black	lb.	.10	@	.40
Micronex	lb.	.05½	@	.11
Thermatomic-Thermax	lb.	.04	@	.07
Flex	lb.	.05	@	.08
P-33	lb.	.06	@	.09
United carbon, fob Tex.	lb.	.05½	@	.11
Velvetex carbon	lb.	.04	@	.06
Blanc fixe dry f.o.b. works	ton	75.00	@	90.00
Carrara filler	lb.	.01¾	@	.02
Catalpo (fact.)	lb.	.02	@	—
Clay, China, domestic	ton	8.00	@	9.00
Aerfloted Suprex	ton	10.00	@	22.00
Congaree, c. l. f.o.b. mine	ton	9.00	@	—
Dark Blue Ridge	ton	9.00	@	20.00
Dixie	ton	15.00	@	29.00
Langford	ton	10.00	@	—
Lexington	ton	10.00	@	22.00
Mineral Flour, c. l. fob mine	ton	20.00	@	23.00
Par	ton	7.00	@	—
Tensulite		15.00	@	—
Glues, extra white	lb.	.22	@	.26
medium white	lb.	.20	@	.24
Magnesia, carbonate	lb.	.08¾	@	.11
Mica, white water grnd.	lb.	.06	@	.08
Off color (biotite)	lb.	.05	@	.07
Rotten Stone powdered)	lb.	.02	@	.05
Soapstone, powdered	ton	15.00	@	22.00
Starch, powdered	cwt.	3.72	@	4.02
Talc, dpmestic	ton	12.00	@	15.00
Pyrax A	ton	7.50	@	—
Whiting, commercial	cwt.	—	@	1.00
English cliffstone	cwt.	1.75	@	2.00
Quaker	ton	13.00	@	22.00
Superfine	ton	10.00	@	12.00
Sussex	ton	8.00	@	15.00
Witco	ton	20.00	@	—
Zinc Carbonate	lb.	.09½	@	.10½
Zinc Stearate	lb.	.23½	@	.25

MINERAL RUBBER

Genasco (factory)	ton	50.00	@	52.00
Granulated M. R.	ton	30.00	@	45.00
Hard Hydrocarbon	ton	24.00	@	40.00
Paradura	ton	62.50	@	65.00
Pioneer, MR, solid	ton	40.00	@	42.00
Pioneer-granulated	ton	50.00	@	52.00
R & H Hydro-Carbon	ton	27.05	@	29.00
Robertson, MR, solid	ton	34.00	@	39.00
M.R. (gran)	ton	38.00	@	40.00

SOFTENERS

Acids				
Nitric, 36 degrees	cwt.	5.00	@	5.25
Sulfuric, 66°	cwt.	1.60	@	1.95
Tartaric, crystals	lb.	.38	@	.38½
Acids, Fatty				
Laurex	lb.	.15	@	.16
Stearex	lb.	.18	@	.19
Stearic, double pressed	lb.	.17	@	.23
Alkalies				
Caustic soda, 76%	cwt.	3.76	@	3.91
Soda ash, 58% C.L.	cwt.	1.40	@	
Oils				
Corn, refined, bbls.	lb.	.09	@	.10¼
Cottonseed, crude		—	@	.07½
Cycline	gal.	.27	@	.34
Degras (c.l. 100 bbls.)	lb.	.03¾	@	—
Less c. l. (10-25 bbls.)	lb.	.04	@	—
Lots less than 10 bbls.	lb.	.04¼	@	.04½
Fluxrite	lb.	.05½	@	.06½
Palm Lagos	lb.	.07¾	@	.07½
Niger	lb.	.06¾	@	.07
Para-Flux	gal.	.17	@	—
Petrolatum, white	lb.	.08	@	.08½
Pigmentaroil	gal.	.21	@	.36
Pine, steam distilled	gal.	.65	@	.70
destructively distilled	gal.	.55	@	.58
Witco Palm Oil	lb.	.11	@	—
Witco Softener (f.o.b. wks.)	lb.	.02	@	—
Resins and Pitches				
Pitch, Burgundy	lb.	.06½	@	.07½
coal tar	gal.	.05½	@	.06
pine, 280 lb. gr. wt.	bbl.	9.00	@	10.00
Rosin, grade K, 280 lb.	bbl.	—	@	8.65
Pigmentar	lb.	.038	@	.044
Tar Retort, 50 gal.	bbl.	13.50	@	15.00
Solvents				
Acetone, pure	lb.	.11	@	.12
Alcohol denatured, No. 1 bbls.	gal.	.51	@	—
Benzol, 90%	gal.	.22	@	.24
Carbon bisulphide	lb.	.05½	@	.06¼
Carbon tetrachloride	lb.	.06¼	@	.07
Dryolene (f.o.b. Okla.)	gal.	.10	@	.10¼
Gasoline, steel bbls.	gal.	.16	@	—
Naptha, solvent	gal.	.35	@	.40
Rub-Sol (f.o.b .Okla.)	gal.	.09	@	—
Turpentine, spirits	gal.	.55	@	.61¼
wood	gal.	—	@	.51
destructively distilled	gal.	.40	@	.43
Waxes				
Beeswax, white	lb.	.51	@	.53
Carnauba	lb.	—	@	.35
Ceresin, white	lb.	.10	@	.11
Montan, crude	lb.	.06½	@	.07
Ozokerite, black	lb.	.24	@	.25
green	lb.	.26	@	.30
Paraffin (c. l.—f.o.b. N. Y.)				
Yellow crude scale	lb.	.03¼	@	—
White crude scale 124/126	lb.	.03¼	@	—
Refined, 125/127	lb.	.04¼	@	—
Refined, 128/130	lb.	.04½	@	—
Refined, 135/137	lb.	.05¾	@	—
Refined, 138/140	lb.	.07¾	@	—

ANTI-OXIDANTS

Agerite, Resin	lb.	.57	@	.62
Powder	lb.	.57	@	.62
White	lb.	1.10	@	1.20
Albasan	lb.	.70	@	.75
Antox	lb.			
B-L-E	lb.	.57	@	.60
Neozone	lb.			
Oxynone	lb.	.68	@	.80
Resistox	lb.	.54	@	.57
Stabilite	lb.	.57	@	.62
Stabilite Alba	lb.	.70	@	.75
VGB	lb.	.55	@	.60

SPECIALTIES

Sunproof	lb.	.35	@	.37½
Tonox	lb.	.56	@	.60

SUBSTITUTES

Black	lb.	.08	@	.14
White	lb.	.16	@	.16
Brown	lb.	.08	@	.15

VULCANIZING INGREDIENTS

Sulfur Chloride (drums)	lb.	.03½	@	.04½
Sulfur flour, Ref'n'd, 100% pure (bags)	cwt.	2.40	@	2.75
Commercial (bags)	cwt.	1.75	@	2.10
Vandex	lb.	1.80	@	2.10

TIRES & TUBES
CRUDE RUBBER

STATISTICAL SECTION

AUTOMOBILES
GASOLINE

AUTOMOBILE production during February jumped ahead, according to official figures just released by the Department of Commerce, and the March output is expected to be appreciably higher. Domestic factories turned out 323,962 units and Canadian plants 15,548 units, a total of 339,510 units. This compares with a total American and Canadian production of 283,558 cars and trucks in January and with an output of 497,705 units in February, 1929.

The discrepancy between February net imports and consumption was somewhat greater than had been expected, due to a falling off in consumption to a level lower than that of the past two years. Consumption was only 32,726 long tons, while net imports were probably well over 40,000 long tons. Domestic stocks, according to the Rubber Manufacturers Association, increased from 120,649 long tons on January 31 to 131,748 long tons on February 28.

British stocks have also continued to rise steadily, reaching new high totals. Combined London and Liverpool stocks on March 15 were 87,734 long tons as compared with 85,076 long tons on March 1. The amount of crude rubber on hand at Singapore and Penang, on estates, and at other manufacturing centers throughout the world is also gaining, making world stocks higher than ever before in the history of the commodity.

Latest figures covering imports and exports from the leading producing and consuming countries have been added to the appropriate tables in this section.

PLAN OF THE SECTION

The statistics included in this section have been chosen for their constant importance to the rubber industry. The tables are reprinted in the same relative position in every issue, each table being kept current by the addition of new figures as soon as they become available.

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U. S. Imports and Exports of Crude Rubber

	Gross Imports			Re-exports			Net Imports
YEARS	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons
1921	185,394	73,772,677	17.76	5,716	2,414,924	18.86	179,678
1922	301,076	101,848,188	15.10	4,809	1,921,928	17.84	296,267
1923	309,144	185,060,304	26.72	8,772	5,672,319	28.87	300,372
1924	328,056	174,231,331	23.71	10,309	6,057,637	26.23	317,747
1925	396,642	429,705,014	48.36	14,827	19,847,753	59.76	381,815
1926	413,338	505,817,807	54.63	17,671	28,470,583	56.77	395,667
1927	426,258	389,874,774	35.60	27,775	24,715,488	39.76	398,483
1928	499,781	244,854,978	25.03	32,159	18,128,361	25.17	467,572
1929	560,084	239,178,783	19.15	36,485	16,868,733	20.64	523,599
1927:							
July	37,677	31,678,259	37.53	1,958	1,560,353	35.59	35,719
Aug.	32,810	26,396,931	75.92	1,809	1,382,765	34.12	31,001
Sept.	33,301	25,314,412	33 94	3,500	3,036,929	38.74	29,801
Oct.	30,184	22,163,282	32.78	2,513	2,042,713	36.29	[illegible]
Nov.	28,592	27,395,428	31.69	2,469	2,014,196	36.43	26,123
Dec.	30,727	22,213,574	32.26	2,655	2,245,754	37.77	28,082
1928:							
Jan.	39,107	30,278,444	34.56	1,988	1,784,990	38.95	37,119
Feb.	33,663	27,763,655	36.82	2,738	2,229,589	36.35	30,925
Mar.	40,611	32,103,042	35.29	3,718	2,587,435	31.07	36,893
Apr.	37,935	27,287,266	32.11	2,272	1,415,024	27.80	35,663
May	31,059	19,058,672	27.39	2,399	1,386,307	25.80	28,660
June	27,765	14,121,219	22.71	2,621	1,400,697	23.86	25,144
July	31,258	14,144,765	20.20	3,087	1,451,446	20.99	28,171
Aug.	31,204	12,860,150	18.39	2,377	1,084,646	20.37	28,827
Sept.	39,835	16,512,019	18.50	3,038	1,384,148	20.34	36,797
Oct.	44,658	18,200,332	18.44	2,405	1,085,407	20.15	41,653
Nov.	36,519	14,878,441	18.19	2,788	1,207,089	18.52	33,731
Dec.	43,511	17,580,966	18.04	2,738	1,165,748	19.00	40,773
1929:							
Jan.	57,564	22,872,943	17.74	3,663	1,773,401	21.61	53,901
Feb.	64,265	24,760,111	17.20	2,955	1,374,783	20.77	61,310
Mar.	50,604	20,380,905	17.98	4,218	2,094,037	22.16	46,386
Apr.	55,725	23,542,726	20.46	3,293	1,624,237	22.02	52,432
May	51,161	24,355,511	21.25	2,386	1,349,690	21.24	48,825
June	41,663	18,799,307	20.14	3,152	1,470,746	20.83	38,511
July	43,944	19,342,147	19.65	3,424	1,590,411	20.78	40,520
Aug.	37,222	16,530,090	19.83	2,644	1,222,217	20.80	34,578
Sept.	34,472	15,214,485	19.70	2,011	861,068	19.11	32,461
Oct.	38,163	16,192,261	18.94	2,614	1,190,510	20.33	35,549
Nov.	43,507	18,189,305	18.66	2,929	1,300,354	19.82	40,578
Dec.	42,952	17,573,330	18.27	2,745	1,007,279	16.38	40,207
1930:							
Jan.	47,496	17,793,563	16.72	3,144	1,077,415	15.30	44,352
Feb.							
Mar.							
Apr.							
May							
June							

U. S. Consumption of Crude Rubber

(Rubber Manufacturers' Association statistics raised to 100 per cent—All figures in long tons)

Figures on Monthly Basis

	1923	1924	1925	1926	1927	1928	1929	1930
Jan.	30,106	29,058	29,638	32,196	31,518	34,403	43,002	36,669
Feb.	30,149	25,736	29,761	31,136	30,137	33,702	41,594	32,726
Mar.	36,629	28,385	33,498	32,936	36,141	35,688	44,730	
Apr.	29,085	27,129	34,139	32,696	35,871	32,772	47,521	
May	36,155	25,845	35,322	29,364	34,592	37,333	49,233	
June	24,272	22,753	35,822	28,598	33,801	37,676	43,227	
July	17,685	23,396	36,053	27,577	29,219	37,407	41,526	
Aug.	20,359	28,982	35,909	34,533	33,460	42,927	38,274	
Sept.	17,594	31,497	31,691	32,904	27,214	39,882	34,707	
Oct.	21,321	31,520	29,047	29,836	26,790	40,857	34,800	
Nov.	20,437	27,289	28,853	28,080	26,792	37,461	27,659	
Dec.	31,902	27,199	28,748	26,293	25,492	31,232	23,531	
Totals	305,694	328,769	388,481	366,149	371,027	441,340	469,804	

Figures on Quarterly Basis

Quarter	1922	1923	1924	1925	1926	1927	1928	1929
Jan./Mar.		96,776	87,609	95,263	94,301	99,216	103,558	128,565
Apr./June	127,360	89,493	75,674	104,099	87,109	103,242	103,500	139,292
July/Sept.		55,621	83,813	99,493	93,793	89,210	117,573	113,746
Oct./Dec.	155,067	63,617	92,656	85,789	83,212	80,860	117,597	84,872
Totals	282,427	305,507	339,752	384,644	358,415	372,528	442,227	466,475

Note—The Rubber Association estimates its monthly rubber consumption figures to be 90 per cent complete. Up until 1925 the quarterly figures were likewise estimated to be 90 per cent complete; beginning with 1925 an estimate of 92 per cent completeness has been used. These estimates have been used in raising the figures in this table to 100 per cent. The quarterly figures are generally regarded as the most authentic; the monthly figures may be accepted as preliminary.

Rubber Invoiced to the U. S.

(Reported by American Consuls—Quantities in Long Tons)

During the Week Ended	From Br. Malaya	From Ceylon	From Dutch East Indies	From London & Liverpool	Total
Dec. 21	7,599	1,953	2,003	22	11,577
Dec. 28	4,943	364	1,856	5	7,168
Jan. 4	8,067	1,587	2,419	251	12,124
Jan. 11	7,235	931	1,469	15	9,650
Jan. 18	7,009	898	1,560	49	9,516
Jan. 25	9,212	1,103	2,051	14	12,380
Feb. 1	5,078	1,213	1,679	98	8,068
Feb. 8	9,902	1,788	2,572	31	14,293
Feb. 15	7,223	1,312	1,315	59	9,909
Feb. 22	7,010	1,223	2,389	51	10,673
Mar. 1	8,146	2,315	2,898	57	13,416
Mar. 8	6,637	925	1,990	45	9,597
Mar. 15	6,256	658	1,786	10	8,710

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave
1927																																
Sept.	34	33⅝	—	—	—	33⅝	33⅝	33⅝	33⅝	33⅝	33⅝	33⅝	34⅜	34⅜	34	34	33⅝	33⅝	33⅝	33⅝	33⅝	33⅝	33¾	33½	—	33⅝	34	34	33⅝	33⅝	—	33⅝
Oct.	—	33⅝	—	33¾	33½	33⅝	33⅝	33⅝	33⅝	33⅝	34⅛	34⅜	34⅜	34⅜	34⅜	34⅜	34⅜	34⅜	34½	34⅜	34⅜	34⅜	34⅜	34⅜	34⅜	34⅜	34½	35¼	35¼	35¼	35¼	34⅜
Nov.	35	35¼	35⅛	35⅝	36¼	36⅝	36¾	37	37	36⅝	36¾	36¾	36½	37⅛	37⅜	38⅜	38⅝	38⅝	38⅝	38⅝	38⅝	38⅝	38¾	38¾	38¾	38¾	38¾	41¼	40	40	41½	37½
Dec.	40½	40¾	40⅜	40⅜	40⅝	—	40½	40	40½	40½	—	40¾	40¾	40	40	40	40	40	40	40⅝	40⅝	40⅝	40⅝	40⅝	40⅝	—	41½	41⅝	41¾	41⅛	41½	40¾
1928																																
January	—	—	41¾	41¾	41¾	41	41	—	—	40⅝	40¾	40⅝	40⅝	40½	40¾	40¾	40¾	—	40⅝	40⅝	40⅝	40⅝	40⅝	40¾	40¾	40¾	39¾	39¼	39	38⅝	40¼
February	37½	—	37¾	37⅝	—	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝	36⅝
March	29	28⅝	28⅞	29	28⅝	26¼	26¼	26¾	26¼	25¾	25¾	25¾	25½	25½	25½	25½	25¼	25¼	25¼	25¼	25¼	25¼	25¼	25¼	25¼	25¼	25¼	25¼	25¼	25¼	25¼	25¼
April	27¼	27¼	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜	27⅜
May	17½	17½	18⅛	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼
June	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾
July	19½	19½	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾
August	19½	19½	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾	19¾
September	—	18⅝	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½
October	—	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½
November	—	18¾	18¾	18¾	18¾	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½	18½
December	—	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾
1929																																
January	—	18¾	18¾	18¾	18¾	18¾	18¾	18¾	18¾	18¾	18¾	20	20	20	20	20	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼
February	22	22	22	22¼	22¼	22¼	22¼	22¼	22¼	22¼	22¼	25	25	24¾	24¾	24¾	25¼	25¼	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾
March	26	23¼	23¼	26	26	25¾	25¾	25½	25½	25¾	25¾	25¾	25¾	25¾	25¾	25¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾	24¾
April	23	19¾	19¾	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½	22½
May	19¾	19¾	19¾	19¾	19¾	20¾	20¾	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼
June	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼	21¼
July	20¾	21¼	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Aug.	21¾	21¾	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Sept.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oct.	19¾	19½	19¾	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼	20¼
Nov.	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾	17¾
Dec.	—	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼	16¼
1930																																
January	—	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾	15¾
February	—	16¼	—	15	15	15	15½	15½	15½	15½	15½	15½	15½	15½	15½	15½	15½	15½	15½	15½	15½	15½	15½	16½	16	16	—	15¾	15¾	15¾	—	15¾
March	—	15¾	—	15¾	15	15	15⅛	15⅜	15⅜	15⅜	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Market)

Average Price per Pound for Years 1910-1921

Year	Cents	Year	Cents	Year	Cents
1910	206.60	1914	65.33	1918	60.15
1911	141.30	1915	65.85	1919	48.70
1912	121.60	1916	72.50	1920	26.26
1913	82.04	1917	72.23	1921	16.56

Average Monthly Price per Pound Since 1922

Months	1922 Cents	1923 Cents	1924 Cents	1925 Cents	1926 Cents	1927 Cents	1928 Cents	1929 Cents	1930 Cents
Jan.	18.82	32.73	25.86	36.71	79.50	38.75	40.25	20.14	15.24
Feb.	16.12	35.14	25.29	36.01	62.25	38.25	32.75	23.97	15.85
Mar.	14.53	34.21	22.83	41.00	59.00	41.04	26.82	24.55	——
Apr.	15.99	32.48	22.51	43.64	51.25	40.86	18.97	21.18	——
May	15.25	27.39	18.89	58.47	47.75	40.76	18.99	21.46	——
June	15.11	26.88	18.81	77.26	42.50	37.25	19.59	20.64	——
July	14.67	26.10	22.16	103.16	41.03	34.87	19.40	21.30	——
Aug.	13.93	28.84	26.17	82.99	38.50	35.12	19.46	20.59	——
Sept.	14.44	28.95	27.56	88.88	41.00	33.67	18.47	20.37	——
Oct.	19.78	26.93	31.13	98.01	42.50	34.32	18.83	19.67	——
Nov.	23.88	27.14	34.33	104.80	38.50	37.58	18.26	16.62	——
Dec.	27.42	26.60	37.88	98.51	38.25	40.63	17.97	16.12	——
Average for Year	17.50	29.45	26.20	72.46	48.50	37.72	22.48	20.55	——

London Closing Prices of Ribbed Smoked Sheet

(In Pence Per Pound)

Day	Dec.	Jan.	Feb.	Mar.	Day	Dec.	Jan.	Feb.	Mar.
1	—	—	7⅝	7⅞	17	8	7⅝	8	7½
2	8	7⅞	—	—	18	8	7¾	8⅛	7½
3	7⅞	7¾	7½	7⅞	19	7¾	—	8⅛	7½
4	8	7¾	7½	7¾	20	7¾	7⅜	8¼	—
5	8	—	7½	7⅜	21	7⅞	7⅜	8¼	—
6	8	7¾	7⅝	7½	22	—	7⅜	8⅜	—
7	8	7⅝	7¾	7½	23	7¾	7⅜	—	—
8	—	7⅜	7⅞	7⅝	24	7¾	7½	8⅛	—
9	8	7⅜	—	—	25	—	7½	8⅛	—
10	8	7⅛	7⅞	7⅝	26	—	—	8⅛	—
11	8⅛	7	7⅞	7½	27	7⅞	7½	7⅞	—
12	8	—	8	7½	28	7⅞	7½	7⅞	—
13	8	7¼	8	7½	29	—	7½	—	—
14	8	7¼	8	7½	30	8	7½	—	—
15	—	7¼	8	7⅝	31	8	7½	—	—
16	8	7½	—	—					

Average Monthly Price Per Pound

Month	1928 Pence	1929 Pence	1930 Pence	Month	1928 Pence	1929 Pence	1930 Pence
Jan.	19.310	9.942	7.471	Aug.	9.300	10.505	——
Feb.	15.713	11.875	7.948	Sept.	8.530	10.160	——
Mar.	12.736	12.135	——	Oct.	8.807	9.620	——
Apr.	8.864	10.490	——	Nov.	8.596	8.442	——
May	8.845	10.717	——	Dec.	8.570	7.958	——
June	9.293	10.580	——	Average for Year	10.656	10.291	——
July	9.312	11.065	——				

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Day of Month	Feb.	Mar.	Day of Month	Feb.	Mar.	Day of Month	Feb.	Mar.
1	16.50	15.10	11	15.90	14.30	21	15.30	——
2	——	——	12	——	14.55	22	——	——
3	16.10	15.00	13	15.80	14.50	23	——	——
4	16.20	14.90	14	15.85	14.70	24	14.90	——
5	16.15	14.60	15	15.90	14.85	25	15.10	——
6	15.75	14.50	16	——	——	26	15.15	——
7	15.20	14.15	17	15.65	15.05	27	15.35	——
8	15.40	14.05	18	15.65	15.55	28	15.30	——
9	——	——	19	15.40	15.45	29	——	——
10	15.75	14.00	20	15.40	——	30	——	——
						31	——	——

Average Monthly Price Per Pound

Month	1928 Cents	1929 Cents	1930 Cents	Month	1928 Cents	1929 Cents	1930 Cents
Jan.	19.12	20.22	17.21	Aug.	19.28	18.62	——
Feb.	18.40	20.21	15.62	Sept.	18.67	18.83	——
Mar.	19.38	20.19	——	Oct.	19.62	18.46	——
Apr.	20.63	20.29	——	Nov.	19.84	17.53	——
May	21.58	19.41	——	Dec.	20.22	17.28	——
June	21.50	18.74	——	Average for Year	19.97	19.03	——
July	21.36	18.62	——				

Stock of Crude Rubber in the U. S.

(All Quantities in Long Tons)

At	ON HAND			AFLOAT			ON HAND AND AFLOAT		
End of	1928	1929	1930	1928	1929	1930	1928	1929	1930
Jan.	110,244	76,342	120,649	41,256	78,596	61,863	151,500	154,938	182,512
Feb.	108,955	90,058	131,748	43,316	63,825	63,404	152,271	153,883	195,152
March	114,061	100,536		39,324	56,476		153,385	157,012	
April	113,083	107,659		33,986	55,409		147,069	163,068	
May	105,356	97,192		34,374	55,404		139,730	152,596	
June	90,198	92,061		40,001	46,035		130,119	138,096	
July	83,242	92,535		42,304	38,858		125,546	134,393	
Aug.	68,994	90,769		51,875	41,618		120,869	132,387	
Sept.	68,851	84,362		48,566	49,480		117,417	133,842	
Oct.	66,421	88,483		41,571	62,294		107,992	150,777	
Nov.	61,956	92,219		68,119	62,358		130,075	154,577	
Dec.	66,166	105,138		68,764	62,389		134,930	167,527	

(Rubber Manufacturers' Association figures raised to 100%.)

Stock of Crude Rubber in London

(No. of Tons in Wharves and Warehouses, including Latex)

At end of	1927	1928	1929	At end of	1927	1928	1929
Jan.	54,994	66,524	25,191	July	63,717	35,429	30,080
Feb.	58,826	62,964	25,554	Aug.	64,491	32,084	35,605
Mar.	63,055	58,272	28,214	Sept.	68,236	31,440	42,188
Apr.	66,897	53,425	31,368	Oct.	69,569	24,207	47,803
May	67,169	44,628	31,290	Nov.	67,050	17,775	52,454
June	63,902	38,756	31,025	Dec.	63,793	19,815	54,304

At End of Recent Weeks

Stocks in London

	First Saturday	Second Saturday	Third Saturday	Fourth Saturday	Fifth Saturday
1929					
May	31,580	31,127	30,955	30,893	
June	31,539	31,635	31,127	30,617	30,982
July	29,996	30,661	30,790	30,167	
August	30,937	31,444	33,575	34,651	35,605
September	36,620	37,901	40,151	42,077	
October	43,473	44,339	45,711	46,819	
November	48,092	49,302	50,068	51,012	52,538
December	53,431	53,180	53,894	54,260	
1930					
January	56,616	58,990	59,607	59,984	
February	60,460	61,482	62,659	62,725	
March	64,383	66,418	66,885		

Stocks in Liverpool

1929					
May	4,614	4,284	4,216	4,665	
June	4,642	4,750	4,733	4,515	4,628
July	4,393	4,547	4,757	4,739	
August	4,662	4,481	5,993	7,285	7,560
September	8,351	8,660	9,780	10,161	
October	10,795	11,571	11,788	12,665	
November	14,272	16,158	17,543	17,479	17,752
December	17,922	18,263	18,696	19,059	
1930					
January	19,428	19,640	19,515	20,063	
February	19,898	19,761	19,677	19,704	
March	20,693	20,727	20,849		

Rubber in Singapore and Penang

(Stocks held by Dealers—Quantities in Long Tons)

End of	1928	1929	1930	End of	1928	1929	1930
Jan.	25,868	29,617	37,123	July	18,663	33,859	—
Feb.	22,867	32,373	—	Aug.	18,971	30,834	—
Mar.	20,588	29,437	—	Sept.	14,898	32,138	—
Apr.	16,946	26,474	—	Oct.	12,149	33,770	—
May	17,437	30,764	—	Nov.	29,188	30,963	—
June	18,207	30,409	—	Dec.	32,895	35,548	—

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total	Per Cent Balloons		Total	Per Cent Balloons
1922	16,297,735	0.0	1926	24,199,524	78.8
1923	23,140,320	0.6	1927	19,700,003	79.1
1924	21,863,311	19.7	1928	24,247,282	81.6
1925	26,001,664	66.3	1929	24,141,502	80.3
1929			1930		
July	1,896,666	78.2	January	1,601,326	84.0
August	1,570,099	79.4	February	1,653,421	78.9
September	2,110,003	80.7	March		
October	1,647,350	76.4	April		
November	596,989	64.7	May		
December	879,259	79.0	June		

U. S. Consumption of Gasoline

(In Barrels of 42 Gallons)

MONTHS	1929	1930	MONTHS	1929	1930
January	22,602,000	25,731,000	July	36,860,000	
February	22,776,000		August	37,759,000	
March	28,495,000		September	34,193,000	
April	32,019,000		October	32,816,000	
May	34,117,000		November	31,502,000	
June	33,163,000		December	26,550,000	

U. S. Tire and Tube Statistics

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Figures for Recent Years

	1922	1923	1924	1925	1926	1927	1928	1929
Production	40,932	45,259	51,633	60,845	61,237	64,439	77,944	73,368
Shipments	39,987	45,204	50,120	59,262	59,002	64,059	74,296	74,021
Inventory[2]	6,132	5,772	7,427	8,142	10,456	10,264	13,624	12,627

Figures for Recent Months

	PRODUCTION			SHIPMENTS			INVENTORY		
	1927	1928	1929	1927	1928	1929	1927	1928	1929
Jan.	4,965	5,358	6,722	4,932	5,394	6,626	10,432	9,949	13,712
Feb.	5,095	6,363	6,912	4,458	5,031	5,282	11,075	11,721	15,496
Mar.	6,276	6,819	7,519	5,701	5,731	6,708	11,863	12,389	16,551
Apr.	6,299	6,178	7,884	5,701	5,812	7,294	12,122	12,71.	16,929
May	6,151	6,759	8,145	5,657	6,457	7,184	12,462	13,024	17,849
June	6,202	6,692	7,304	6,253	7,117	7,254	12,462	12,162	17,957
July	5,087	6,498	6,475	5,973	7,895	7,855	11,326	11,157	15,530
Aug.	5,752	7,469	5,806	6,393	8,403	7,845	10,721	10,034	14,226
Sept.	4,822	6,802	4,758	5,717	7,145	5,998	9,722	9,765	12,875
Oct.	4,773	7,326	4,919	4,799	5,717	4,960	9,665	11,520	12,845
Nov.	4,502	6,075	3,603	4,306	4,998	3,558	10,136	12,579	12,935
Dec.	4,497	5,605	3,261	4,165	4,591	3,346	10,264	13,624	12,627

AUTOMOBILE INNER TUBES

Figures for Recent Years

	1922	1923	1924	1925	1926	1927	1928	1929
Production	50,850	60,116	70,706	82,614	76,618	70,823	80,180	73,417
Shipments	49,673	59,072	68,016	81,094	71,591	72,896	77,127	75,298
Inventory[2]	7,643	8,425	11,052	11,313	16,200	13,692	16,117	13,660

Figures for Recent Months

	PRODUCTION			SHIPMENTS			INVENTORY		
	1927	1928	1929	1927	1928	1929	1927	1928	1929
Jan.	5,337	5,441	6,517	6,016	6,072	7,242	15,585	13,982	15,356
Feb.	5,653	6,895	6,769	5,120	5,431	5,278	16,075	14,650	16,999
Mar.	7,184	6,231	7,466	6,157	5,731	6,737	17,096	15,573	17,750
Apr.	7,373	6,661	7,634	6,359	5,702	7,164	17,801	16,638	18,134
May	6,737	7,168	7,660	6,140	6,300	7,038	18,389	17,702	18,928
June	6,306	6,953	6,978	6,832	7,136	6,950	17,858	17,159	18,741
July	5,284	6,674	6,178	7,070	8,729	8,115	16,004	14,974	16,832
Aug.	6,480	8,343	5,846	7,983	9,350	8,183	14,564	13,931	14,157
Sept.	5,651	7,103	5,536	6,758	7,154	6,250	13,511	13,543	13,424
Oct.	5,065	6,929	5,310	5,024	5,662	5,001	13,539	15,285	13,656
Nov.	4,775	5,592	3,780	4,723	5,002	3,712	13,585	15,743	13,701
Dec.	4,969	5,184	3,716	4,712	4,858	3,631	13,692	16,117	13,660

(1) Rubber Manufacturers' Association figures, raised to 100%. The Association estimates its figures to be 75% representative or complete when issued and that basis has been accepted when preparing the statistics in this table.

(2) Held by manufacturers at end of period indicated.

Automobile Production

	United States			Canada			
	Total	Passenger Cars	Trucks	Total	Passenger Cars	Trucks	Grand Total
1923	4,020,255	3,631,728	388,527	146,438	129,228	17,210	4,166,693
1924	3,600,918	3,203,049	397,869	135,246	117,765	17,481	3,736,164
1925	4,265,704	3,760,459	505,245	161,389	139,311	22,078	4,427,093
1926	4,298,799	3,808,753	490,046	205,092	164,483	40,609	4,503,891
1927	3,303,887	2,938,868	453,019	179,426	146,870	32,556	3,573,313
1928							
July	390,445	237,933	52,512	25,226	20,122	5,104	415,671
Aug.	458,429	400,689	57,740	31,245	24,274	6,971	489,674
Sept.	413,722	358,872	54,850	21,193	16,572	4,621	434,915
Oct.	397,096	339,976	57,120	18,536	13,016	5,520	415,632
Nov.	256,936	217,256	39,680	11,769	8,154	3,615	268,705
Dec.	233,135	205,144	27,991	9,425	6,734	2,691	242,560
TOTAL	4,357,384	3,826,613	530,771	242,382	196,787	45,645	4,599,944
1929							
Jan.	402,154	350,617	51,537	21,501	17,164	4,337	423,655
Feb.	466,084	407,589	58,495	31,287	25,584	5,703	497,371
March	584,733	513,266	69,559	40,621	32,833	7,788	625,354
April	630,656	538,679	91,977	41,901	34,392	7,509	662,557
May	603,969	516,055	86,596	31,559	25,129	6,430	635,528
June	545,252	453,956	91,296	21,492	16,511	4,981	566,744
July	500,331	427,213	73,118	17,461	13,600	3,861	517,792
Aug.	499,629	444,711	54,918	14,214	11,037	3,177	513,843
Sept.	415,332	365,651	49,681	13,817	10,710	3,107	429,149
Oct.	380,011	321,195	58,816	14,523	8,975	5,548	394,534
Nov.	217,570	170,928	46,642	9,424	7,137	2,287	226,994
Dec.	119,950	92,717	27,233	5,495	4,426	1,069	125,445
TOTAL	5,358,361	4,603,609	754,752	263,295	207,498	55,797	5,621,656
1930							
Jan.	273,089	235,099	37,990	10,388	8,856	1,532	283,477
Feb.							
March							
April							
May							
June							

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA[1]							DUTCH EAST INDIES[2]						
	Gross Exports	Imports	Gross Exports Minus Imports	Ceylon[3]	India & Burma[4]	Sarawak[4]	British North Borneo[5]	Siam[4]	Java & Madura	Sumatra E. Coast	Other D.E.I.	Indo-China[4]	Amazon Valley	All Other[4]	World Total[7]
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,955
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,866
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,877	5,377	46,757	65,499	120,626	7,881	25,298	13,797	517,528
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,530
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	577,202	161,525	415,677	81,584	11,663	11,077	7,166	5,018	65,990	87,789	134,037	9,696	21,148	6,589	857,434
1928:															
Feb.	28,848	12,911	15,937	4,947	1,081	667	581	536	4,052	6,757	8,630	787	1,612	1,276	46,860
Mar.	27,879	10,508	17,371	3,683	775	645	581	269	3,999	5,825	9,690	700	2,750	1,211	47,499
Apr.	20,189	9,335	10,804	3,233	789	630	494	258	3,993	5,040	5,499	736	1,614	1,323	33,810
May	26,483	10,350	16,133	3,091	654	542	494	241	4,943	5,355	10,347	717	2,602	1,135	45,994
June	22,994	16,168	6,826	3,107	963	926	494	451	5,419	5,863	13,655	725	1,399	960	40,788
July	30,491	13,383	17,098	5,129	1,043	905	593	366	5,602	7,566	11,594	698	1,264	873	52,731
Aug.	35,674	15,114	20,560	5,720	398	1,227	593	544	5,668	7,428	11,893	712	1,732	450	56,986
Sept.	29,769	11,239	18,530	4,675	457	938	594	447	4,956	6,536	9,863	969	1,614	494	50,073
Oct.	24,476	12,603	11,873	3,999	864	949	564	457	5,295	7,474	10,124	513	1,399	732	44,243
Nov.	68,135	10,436	57,699	8,005	1,048	772	564	425	4,950	7,902	7,805	943	1,790	628	92,526
Dec.	66,763	11,122	55,641	7,848	1,113	744	565	294	5,120	8,792	10,896	948	2,220	588	94,769
1929:															
Jan.	52,546	13,415	39,131	8,301	1,664	873	600	461	5,640	8,067	11,076	850	2,134	642	79,439
Feb.	47,926	12,103	35,823	7,064	1,117	965	600	495	6,572	7,511	10,384	807	2,104	520	73,982
Mar.	49,448	14,553	34,895	6,583	1,413	758	601	499	5,515	6,620	10,629	658	2,332	786	71,289
Apr.	49,816	11,414	38,402	5,097	727	747	548	306	5,997	6,645	11,321	673	1,950	569	72,982
May	43,960	15,593	28,367	5,723	800	966	548	453	6,264	6,961	13,437	1,059	1,922	783	67,233
June	40,398	14,344	26,054	5,563	1,122	1,061	547	422	5,582	6,693	11,270	757	1,398	543	61,017
July	46,454	15,071	31,383	5,457	974	1,247	641	462	6,422	7,192	13,995	575	1,457	543	70,348
Aug.	50,441	15,469	34,972	6,079	685	993	641	431	4,644	7,298	10,782	1,032	1,563	499	69,619
Sept.	53,484	12,392	41,092	7,998	384	832	640	406	4,708	7,517	10,149	655	1,566	504	76,446
Oct.	47,937	12,516	35,421	8,381	812	1,047	600*	485	4,697	8,295	10,512	893	1,606	445	73,194*
Nov.	46,279	11,204	35,075	6,660	1,065	668	600*	278	4,760	6,711	9,380	771	1,442	400*	67,810*
Dec.	48,513	13,451	35,062	8,683	900	930	600*	320	5,189	8,279	11,102	966	1,674	400*	74,105*
1930:															
Jan.	52,535	9,454	43,081	7,037	1,560	791		386	5,709	7,831	8,920	856	1,837		
Feb.												944	1,787		

(1) Malayan net exports cannot be taken as production, since imported rubber is largely wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 115 tons in 1923, 1,117 in 1924, 3,618 in 1925, 3,263 in 1926, 2,439 in 1927 and 1,437 in 1928. (2) Ceylon Chamber of Commerce statistics until 1926; rubber exported as latex is not included— such shipments were equivalent to 18 tons in 1923, 98 tons 1924, 6 tons 1925, 20 tons in 1926, about ½ ton in 1927, and 1 ton in 1928. (3) Official statistics. (4) Imports into Singapore and Penang. (5) Exports from "Other D.E.I." are chiefly wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 2,342 tons in 1923, 1,008 tons 1924, 2,239 tons 1925, 44 tons in 1926, 84 tons in 1927, and 1,459 tons in 1928. (6) Calculated from official import statistics of principal consuming countries, viz., United States, United Kingdom, France, Germany, Belgium and Netherlands. This figure includes guayule rubber. (7) This total includes the third column for British Malaya, "Gross Exports minus Imports," and all the figures shown for the other territories. *Figure is provisional; final figure will be shown immediately it becomes available.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States[1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (ed)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	World Total
1919	236,977	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	342,378
1920	248,762	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	370,641
1921	179,678	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,562
1922	296,267	11,724	24,352	27,546	9,207	15,984	6,430	2,493	2,648	172	-3,807	1,778	589	567	395,885
1923	300,372	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	408,018
1924	317,747	-11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	-807	3,178	944	1,370	414,847
1925	381,815	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	516,493
1926	395,667	34,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,299	1,870	613,643
1927	398,483	60,249	34,271	38,892	26,405	20,521	11,881	12,018	9,490	6,482	636	4,224	2,055	2,672	627,789
1928	404,496	4,846	36,498	37,855	30,447	25,621	12,433	15,184	8,430	7,958	2,243	4,418	3,178	3,138	596,695
1928:															
Jan.	37,120	1,921	1,764	2,485	2,290	1,361	760	755	802	589	52	261	335	376	50,871
Feb.	30,926	3,143	2,526	2,984	2,558	1,245	487	783	616	599	98	307	296	297	46,813
Mar.	36,893	3,179	1,902	3,521	2,989	1,694	763	231	918	816	95	351	497	298	54,247
April	35,663	—2,280	2,204	2,719	1,988	2,384	1,114	1,820	832	575	280	339	304	159	48,001
May	25,660	—5,322	3,297	2,944	2,180	2,288	1,090	3,893	655	746	209	485	220	213	41,558
June	25,143	—3,031	3,597	2,968	2,186	2,102	984	4,111	848	743	133	346	251	182	40,063
July	28,170	—1,374	3,518	3,387	2,692	2,026	1,598	724	591	895	395	294	175	384	43,475
Aug.	28,827	48	3,527	2,744	2,447	1,868	875	632	707	519	316	359	58	94	43,021
Sept.	36,800	4,199	3,524	3,553	2,812	1,837	1,278	20	603	597	345	377	277	235	56,457
Oct.	41,667	—934	3,728	4,386	2,943	3,711	1,049	98	766	696	141	527	250	318	59,346
Nov.	33,846	—3,141	3,278	3,694	2,799	2,150	1,340	689	837	544	31	337	252	252	46,958
Dec.	40,781	8,438	3,633	2,470	2,618	3,002	1,145	1,378	755	689	148	455	263	200	65,906
1929:															
Jan.	53,922	11,951	5,645	4,711	3,759	3,776	1,481	956	1,061	749	218	635	179	525	89,571
Feb.	61,881	5,179	5,001	4,613	2,998	2,727	1,259	684	1,131	627	113	226	115	356	86,275
Mar.	46,891	9,068	4,409	4,586	4,961	2,630	1,515	716	725	931	316	354	80	409	77,091
Apr.	52,447	8,295	4,854	5,351	3,177	2,308	1,407	703	1,518	750	144	956	40	445	82,396
May	48,350	5,112	3,152	3,682	2,937	2,314	1,417	996	1,437	854	201	468	37	277	71,233
June	38,676	4,787	6,814	3,948	3,075	1,593	1,624	695	2,215	672	687	507	24	420	65,737
July	40,914	4,993	4,889	3,559	3,205	2,388	2,023	1,056	2,918	1,039	253	519	30	455	68,801
Aug.	35,207	14,594	4,645	4,082	2,879	3,665	908	700*	724	902	254	429	25	319	69,331*
Sept.	32,171	17,010	3,889	4,691	1,908	3,511	1,224	700*	853	672	253	361	91	477	67,811*
Oct.	35,840	16,111	4,489	3,355	1,821	3,902	1,838	700*	1,125	1,147	278	710	91	201	71,608*
Nov.	40,972	13,141	3,082	3,776	2,709	3,221	1,275	700*	1,458	861	253	595	62	280	71,880*
Dec.	40,488	12,434	4,274	2,921	2,114	2,251	1,198	700*	726	741	52	677			
Jan.	44,759	11,106		3,862	2,842		910								

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced 12 per cent in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1]United States imports of guayule are not included in this compilation; such imports amounted to 4,305 tons in 1926; to 5,010 tons in 1927; to 3,076 in 1928; and to 1,231 tons in 1929. *Figure is provisional; final figure will be shown immediately it becomes available.

Domestic Production of Miscellaneous Rubber Goods

	Rubber Proofed Fabrics Yards	Rubber Heels Pairs	Rubber Soles Pairs	Mechanical Goods Shipments Dollars
1924	25,020,000	186,279,000	(1)	$45,615,000
1925	23,988,000	206,970,000	16,211,620(2)	64,877,000
1926	29,328,000	183,312,000	12,253,000	76,789,000
1927	37,872,000	201,014,000	27,160,000	68,625,000
1928	41,179,000	235,170,000	37,645,000	69,114,000
1928:				
January	2,177,000	17,682,000	3,431,000	$5,630,000
February	2,575,000	19,181,000	3,628,000	5,838,000
March	2,853,000	22,583,000	3,747,000	6,675,000
April	2,416,000	18,575,000	2,928,000	5,406,000
May	2,744,000	21,597,000	3,519,000	6,274,000
June	2,953,000	18,763,000	3,321,000	6,126,000
July	3,447,000	17,629,000	3,168,000	5,157,000
August	4,613,000	21,289,000	3,461,000	6,306,000
September	4,966,000	21,451,000	2,725,000	5,393,000
October	5,914,000	21,932,000	2,297,000	5,837,000
November	4,173,000	18,686,000	2,649,000	5,201,000
December	2,848,000	15,811,000	2,771,000	5,271,000
1929:				
January	2,525,000	19,975,000	3,376,000	6,033,000
February	3,095,000	18,979,000	2,869,000	6,135,000
March	3,952,000	17,226,000	2,746,000	7,013,000
April	4,000,000	17,256,000	2,601,000	7,035,000
May	4,860,000	19,541,000	2,916,000	7,189,000
June	4,409,000	20,007,000	2,502,000	6,792,000
July	4,260,000	19,315,000	1,295,000	6,306,000
August	5,085,000	23,095,000	2,948,000	6,792,000
September	5,507,000	21,702,000	2,841,000	5,906,000
October	6,116,000	22,386,000	3,502,000	5,887,000
November	4,395,000	17,863,000	3,400,000	4,932,000

(1) Not available; (2) Last 9 months only.
Source: "Survey of Current of Business of the Department of Commerce."

United States Imports of Guayule Rubber and Related Gums

(All quantities in Long Tons)

	Guayule Tons	Guayule Dollars	Balata Tons	Balata Dollars	Jelutong Tons	Jelutong Dollars	Gutta Percha Tons	Gutta Percha Dollars
1919	1,490	760,690	727	937,038	8,332	2,213,964	2,900	1,068,698
1920	758	345,985	1,064	1,260,045	5,672	2,068,501	3,183	1,520,309
1921	58	26,945	814	1,077,869	1,745	351,393	985	333,564
1922	127	57,040	812	978,765	2,335	403,812	818	281,012
1923	1,155	542,227	700	898,524	4,565	853,308	912	375,167
1924	1,356	536,392	464	568,456	6,165	1,237,100	1,408	463,610
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	1,603	629,284
1926	4,305	2,562,096	354	327,213	7,268	3,127,757	1,445	661,156
1927	5,018	2,674,957	582	447,246	7,785	2,448,657	1,494	728,172
1928	3,075	1,755,685	731	430,855	7,552	2,540,059	1,597	777,128
1929	1,231	545,175	728	566,964	8,203	2,458,126	447	167,479
1929:								
July	200	86,175	49	46,440	572	180,065	14	5,807
Aug	190	80,443	58	47,769	575	171,733	—	—
Sept.	107	51,156	38	30,327	913	279,225	—	—
Oct.	200	79,968	58	43,756	636	181,421	—	—
Nov.	125	47,796	13	11,600	583	182,677	49	14,935
Dec.	100	41,328	25	19,955	550	156,939	51	12,095
1930:								
Jan.	150	55,272	28	28,549	509	141,384	—	—

Reclaimed Rubber in the United States

(All Quantities in Long Tons—100% Basis)

Year	Production	Consumption Tons	Consumption % to Crude	Stocks*
1920	86,395	75,297	36.4	.....
1921	36,725	41,351	24.1	.....
1922	57,834	54,458	19.3	.....
1923	74,766	69,534	22.7	.....
1924	80,079	76,072	22.4	.....
1928:				
Jan.	14,862	20,140	58.5	21,941
Feb.	15,291	18,670	55.4	20,548
Mar.	17,089	20,680	57.9	19,588
Apr.	15,393	19,280	58.8	19,283
May	18,945	20,215	54.1	18,137
June	18,781	18,140	48.2	18,709
1929:				
Jan.	18,685	21,068	49.1	24,394
Feb.	18,094	19,829	47.7	22,805
Mar.	19,984	20,867	46.7	22,076
Apr.	19,899	22,435	47.3	20,680
May	20,385	23,176	47.1	19,479
June	18,416	18,141	42.0	17,980
1930:				
Jan.	15,010	17,454	47.6	24,241
Feb.	.....	.....	.....	.....
Mar.	.....	.....	.....	.....
Apr.	.....	.....	.....	.....
May	.....	.....	.....	.....
June	.....	.....	.....	.....

Year	Production	Consumption Tons	Consumption % to Crude	Stocks*
1925	132,930	137,105	35.6	13,203
1926	180,582	164,500	45.9	23,218
1927	189,144	178,471	47.6	24,980
1928	208,516	223,000	50.4	24,785
1929	218,954	226,588	48.4	27,464
July	17,278	19,070	51.0	17,305
Aug.	19,049	17,890	41.7	15,881
Sept.	18,692	17,795	44.6	17,991
Oct.	17,182	18,420	45.1	17,026
Nov.	18,245	18,380	49.1	22,899
Dec.	17,728	14,820	45.9	24,785
July	18,387	20,236	48.7	19,679
Aug.	19,787	18,230	47.6	22,309
Sept.	18,660	17,071	49.2	24,984
Oct.	18,865	18,744	53.8	25,117
Nov.	14,363	15,230	55.4	26,080
Dec.	13,429	11,531	49.0	27,464
July	.....	.....	.....	.....
Aug.	.....	.....	.....	.....
Sept.	.....	.....	.....	.....
Oct.	.....	.....	.....	.....
Nov.	.....	.....	.....	.....
Dec.	.....	.....	.....	.....

*Stocks on hand at the end of month or year. Exports of reclaimed rubber, not shown in this table, amounted to 8,540 tons in 1927, 9,577 tons in 1928, and 12,869 tons in 1929.

REVIEW DESK

Books, New Publications, Catalogues, Etc.

LATEX. By Ernst A. Hauser. Published by the Chemical Catalog Company, Inc., 419 Fourth Avenue, New York City. 1930. 202 pp. $4, postpaid (Book obtainable from THE RUBBER AGE, 250 W. 57th St., N. Y. City.)

Until the recent publication of this volume, there has been no comprehensive work in English dealing exclusively with the subject of rubber latex. First published in Germany in 1927, this has now been capably translated into English by W. J. Kelly and will satisfy a long felt need. Dr. Hauser opens his text with a historical introduction, discusses the most important rubber, gutta percha and balata trees, and devotes his third chapter to the various tapping methods. The remaining chapters deal with the physical and chemical properties of latex, the less important latices, the coagulation of the latex, the preparation of whole latex rubber, and the preservation, shipping, concentration, vulcanization and industrial applications of latex. A final chapter on the internal structure of rubber is followed by an exhaustive patent review compiled by Dr. Carl Boehm von Boernegg. (See adv., page 640, this issue.)

RUBBER DISPERSED COLORS. Published by E. I. duPont de Nemours & Company, Inc., Rubber Chemicals Section, Wilmington, Del. 1930. 6 pp. For free distribution.

Recently there has developed a demand for more brilliant shades for rubber products than can be obtained by the use of the inorganic colors that have been used since the early days of the industry. Because the insoluble pigment lakes and toners developed primarily for printing inks and for coloring paper, linoleum, etc., were not wholly satisfactory for this purpose, these rubber dispersed colors have been developed and are furnished in master batches containing about 50 per cent of color and 50 per cent of rubber. More specific information concerning the properties and uses of duPont rubber dispersed colors is given in this circular, together with actual samples in compounded stocks.

WHAT PRICE PERFORMANCE? Published by the Terkelsen Machine Company, 326 A Street, Boston, Mass. 1930. 4 pp. For free distribution.

This circular presents descriptions and illustrations of two Terkelsen molding presses, the Type A-1 Model 50 and the Type E-1 ElectricDraulic, Model 50.

INDUSTRIAL RELATIONS PROGRAMS IN SMALL PLANTS. Published by the National Industrial Conference Board, Inc., 247 Park Avenue, New York City. 1929. 72 pp. $1.50.

The United States Census of Manufactures for 1923 showed that 84.6 per cent of all American industrial establishments employ less than 50 workers, while 11.9 per cent employ between 50 and 250 workers. It is apparent, therefore, that the small plant should not be overlooked in the study of industrial relations programs designed to benefit the worker and increase his efficiency. The data assembled in this investigation show that such work has made greater headway in small establishments than is generally supposed.

MOTION PICTURES AND ILLUSTRATED LECTURES. Published by the General Electric Company, Schenectady, N. Y. 1930. 32 pp. For free distribution.

Through its Visual Instruction Section, the General Electric Company is offering a variety of sound films, silent films and illustrated lectures to schools and engineering societies, with the purpose of disseminating information as to the electrical industry, its accomplishments, and its relation to other industries. There are, for example, "The Land of Cotton," a silent two-reel film depicting plantation and textile mill scenes, and "Wire and Cable," a lecture with glass slides or filmslide describing the manufacture of electric cable. More than a hundred other subjects are listed.

EMPLOYEE THRIFT AND INVESTMENT PLANS. Published by the National Industrial Conference Board, Inc., 247 Park Avenue, New York City. 1929. 114 pp. $1.

The basic purpose of employers to assist members of their working force to acquire a financial surplus has become fairly general, but finds expression in a wide variety of forms, including savings deposits, thrift certificates, investment funds, credit unions, and building and loan associations. These plans are treated in detail in this volume, with the experiences of various organizations outlined. Included in a selected list of companies having some type of employes' thrift or investment plan are the Hood Rubber Company, the Raybestos Company and E. I. du Pont de Nemours & Company.

A Section Devoted to Listings of Leading Producers and Distributors of Raw Materials, Machinery and Equipment, and Supplies for the Rubber Industry.

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Institution of the Rubber Industry

The following papers will be read before the Institution of the Rubber Industry and published from time to time in Volume 5, of the "I. R. I. Transactions":

"Anti-oxidants," Dr. W. J. S. Naunton.
"The Outlook in the Rubber Industry," H. Eric Miller.
"New Developments in Latex Application," Dr. Ernst A. Hauser.
"Electro-deposition," W. A. Williams, F.I.C., F.R.S.E., F.I.R.I.
"A Note on the Suncracking of Vulcanised Rubber," B. B. Evans, B.Sc., A.I.C., A.I.R.I. (Sc.)
"Methods and Appliances Used for the Control of Some Manufacturing Processes in the Rubber Industry," Dr. H. A. Daynes.
"Observations on the Handling of Rubber Stocks," R. W. Griffiths, B.Sc., A. Inst. P., A.I.R.I. (Sc.)
"Rubber as a Substitute for Leather," Dr. P. Schidrowitz.

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